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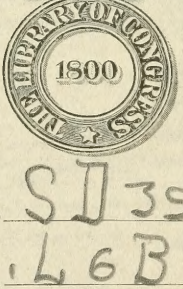

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UNITED STATES DEPARTMENT OF AGRICULTURE
BULLETIN No. 1007
Contribution from the Forest Service
WILLIAM B. GREELEY, Forester

Washington, D. C. PROFESSIONAL PAPER June 5, 1922

UTILIZATION OF BASSWOOD

By

WARREN D. BRUSH, Scientific Assistant

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INTRODUCTION.

Basswood is one of the important commercial timbers of the United States. Nineteen other woods are manufactured into lumber in larger quantities, and factories using lumber for the manufacture of various wooden products consume larger quantities of about 12 other woods, including yellow poplar and white pine, which are often used for the same general class of products as basswood and are frequently substituted for it.

Basswood is valued mainly for its white color, light weight, and good working qualities. It is well adapted for certain special uses for which other woods do not serve as well, and, because of the comparatively small supply now available, it is greatly in demand for these purposes. Basswood is valued highly for products made of wood in the natural state, particularly where a clean, attractive appearance and light weight are essential. Boxes and woodenware used for holding food are the main products.

Basswood lumber is manufactured from several species, but mainly from the species *Tilia americana*, which grows over nearly all of the eastern part of the United States. Other common names for this tree are linden, linn, bass, limetree, whitewood, and beetree. The species *Tilia heterophylla*, which is most commonly called white basswood and is found mainly in the Allegheny Mountain region, also

produces basswood lumber, principally in West Virginia, which is similar to that of *Tilia americana*. There are several other species of basswood in the United States, all of which have wood similar to the common basswood species, but contribute only small quantities of the timber. As the wood of these different species is very much alike, it is not kept separate in the market and is sold as basswood.

PROPERTIES OF THE WOOD.

GENERAL APPEARANCE.

The heartwood of basswood is creamy brown with occasional darker streaks. The sapwood is wide and not sharply defined from the heartwood. The wood has a very uniform appearance; the sapwood and, particularly, rapid-growth timber has a light-colored, clean look very desirable for special purposes. Basswood occasionally shows a curly growth, especially near the butt of the tree, which gives it an attractive appearance. This is unusual, however, and the wood does not normally possess a curly grain nor any figure, such as is found in oak and birch, for instance. It is therefore painted a uniform color or stained to imitate some other wood, when used for such purposes as inside house finish and the exterior woodwork of furniture.

PHYSICAL AND MECHANICAL PROPERTIES.

Basswood timber is light in weight, soft in texture, straight-grained, and has low strength values and poor shock-resisting ability in general comparison with other woods. Compared on the basis of density or weight, basswood has nearly average values for most of its properties, but has slightly greater stiffness and much greater shrinkage for its density than the average. In the classification of woods by the Forest Products Laboratory of the Forest Service into eight groups, according to results of tests for each of six physical and mechanical properties, basswood is described as follows:

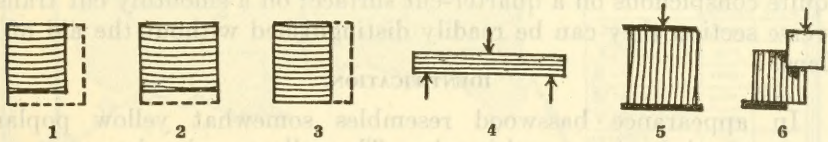
Property:	Classification.
Density or weight	Light.
Strength as a beam or post	Weak.
Hardness	Soft.
Shock-resisting ability	Poor.
Stiffness	Moderately limber.
Shrinkage	Moderate.

Table 1 shows actual and comparative properties of basswood timber, as determined by the Forest Service from a very large number of tests. White oak is the wood generally used as a basis for comparison of properties. The composite values given are a combination of several kinds of tests. The hardness value of basswood is very low compared with white oak on this basis. This is also true of the different strength values, particularly shock-resisting ability.

TABLE 1.—*Actual and comparative properties of basswood timber.*

Locality where grown		Pennsylvania. Wisconsin.
Weight per cubic foot:		
Green	pounds	41
Air-dry	do	26
Kiln-dry	do	25
Specific gravity, oven-dry, based on volume when green		0.325
Shrinkage from green to oven-dry condition:		
In volume (1)	per cent	15.8
Radial (2)	do	6.6
Tangential (3)	do	19.3
Comparative shrinkage (twice volume plus radial plus tangential divided by 3)	per cent	15.8
Strength in bending at 12 per cent moisture: (4)		
Modulus of rupture	pounds per sq. in.	836.5
Relative strength compared with white oak (white oak=100)		56
Strength in compression parallel to grain at 12 per cent moisture: (5)		
Maximum crushing strength	pounds per sq. in.	4,542
Relative strength compared with white oak (white oak=100)		62
Shearing strength parallel to grain at 12 per cent moisture: (6)		
Shearing strength	pounds per sq. in.	1,000
Relative shearing strength compared with white oak (white oak=100)		49
Composite values:		
Strength as a beam or post		6,350
Compared with white oak (white oak=100)		61
Hardness		284
Compared with white oak (white oak=100)		27
Shock-resisting ability		5.48
Compared with white oak (white oak=100)		42
Stiffness		1,231
Compared with white oak (white oak=100)		81

NOTE.—Each of the composite values given in this table is a weighted average of several values derived from different kinds of strength tests. For instance, strength as a beam or post is a combination of values derived from tests in static bending, impact bending, and compression parallel to grain.



1=in volume; 2=radial; 3=tangential; 4=strength in bending; 5=strength in compression parallel to grain; 6=shearing strength parallel to grain.

Table 2 gives the relative properties of yellow poplar, cottonwood, and white pine compared with basswood, since these three woods are often put to the same uses as basswood. This table indicates that basswood is softer than any of these woods, also lighter in the oven-dry condition. In the green condition basswood is heavier than either yellow poplar or white pine because of the higher moisture content of the basswood. Cottonwood, however, is much heavier than basswood when green. Air-dry material of these four species does not differ greatly in weight. Basswood shrinks more than the other species given and its strength values are, in general, lower.

TABLE 2.—*Properties of yellow poplar, cottonwood, and white pine compared with basswood. Basswood=100.*

Species.	Weight.			Shrinkage from green to oven-dry condition.			Strength at 12 per cent moisture.		Composite values.			
	Oven-dry (specific gravity.)	Air-dry.	Green	In volume.	Radial.	Tangential.	Modulus of rupture in bending.	Compression parallel to grain (maximum crushing strength).	Strength as a beam or post.	Hardness.	Shock-resisting ability	Stiffness.
Yellow poplar..	112	104	93	72	62	74	105	111	114	128	103	116
Cottonwood....	112	108	120	89	59	99	96	105	102	119	134	98
White pine.....	109	104	95	49	33	63	102	119	116	128	109	100

Basswood is rated low in durability. The estimated average life of untreated basswood lumber, under conditions subjecting it to decay but not to mechanical wear, is placed at from 3 to 5 years. Its length of life in any particular case may, of course, vary from this, depending on conditions. If properly treated with coal tar creosote, or some other standard preservative, its durability may be greatly increased.[1]

STRUCTURE.

Basswood is a diffuse-porous wood (Pl. I). The pores are about uniform in size and quite evenly distributed throughout the annual-growth ring. They are, however, somewhat less numerous near the outer limits of each annual ring, and this makes a contrast with the greater number of pores at the beginning of each ring so that the growth rings can be quite readily distinguished on a smoothly cut transverse section. Medullary rays are generally not conspicuous on longitudinal surfaces; in some pieces, however, they are reddish and quite conspicuous on a quarter-cut surface; on a smoothly cut transverse section they can be readily distinguished without the aid of a lens.

IDENTIFICATION.

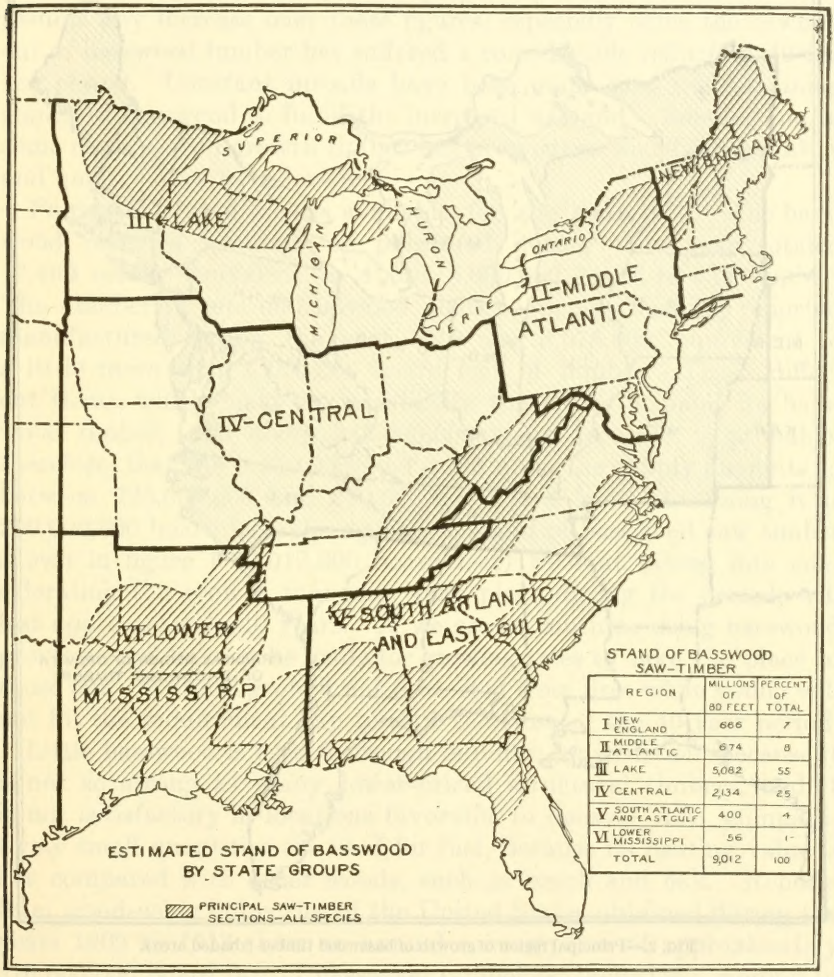
In appearance basswood resembles somewhat yellow poplar, cottonwood, buckeye, and tupelo. The yellow poplar, however, can be distinguished by its yellowish-brown heartwood, which has a characteristic greenish tinge. In cottonwood the medullary rays are very fine and barely visible even with a hand lens on a smoothly cut transverse surface, in contrast to those in basswood, which are visible to the unaided eye; the pores of cottonwood are conspicuously larger than those of basswood, as seen under a hand lens, and cottonwood generally has a "woolly" texture on sawed surfaces. In buckeye and tupelo the rays are also finer than in basswood. The brownish-black, longitudinal streaks occasionally found in the heartwood help to distinguish basswood.

[1] Farmers' Bulletin 744, Preservation of Farm timbers, gives methods of treatment.

SUPPLY.

Basswood timber grows in the eastern half of the United States, but it is not important near the Atlantic coast south of New England nor in the Gulf Coast States.

The estimated stand of basswood is given by regions in figure 1. The New England region contains approximately 666,000,000 board



REGION	MILLIONS OF 80 FEET	PERCENT OF TOTAL
I NEW ENGLAND	666	7
II MIDDLE ATLANTIC	674	8
III LAKE	5,082	55
IV CENTRAL	2,134	25
V SOUTH ATLANTIC AND EAST GULF	400	4
VI LOWER MISSISSIPPI	56	1
TOTAL	9,012	100

FIG. 1.—Estimated stand of basswood by State groups.

feet of timber, or 7 per cent of the supply. The middle Atlantic region, made up of the States of New York, Pennsylvania, New Jersey, Delaware, and Maryland, contains a trifle more. The Lake region, the most important region, contains more than one-half of all the basswood in the United States, or about 5,082,000,000 board feet. The second most important region, the central region, whose

greatest producing States are West Virginia, Tennessee, and Kentucky, contains a quarter of the basswood, while the South Atlantic and East Gulf and lower Mississippi regions contain less than 5 per cent of the supply. The region shown in figure 2 is estimated to contain about 98½ per cent of the total amount in the United States.

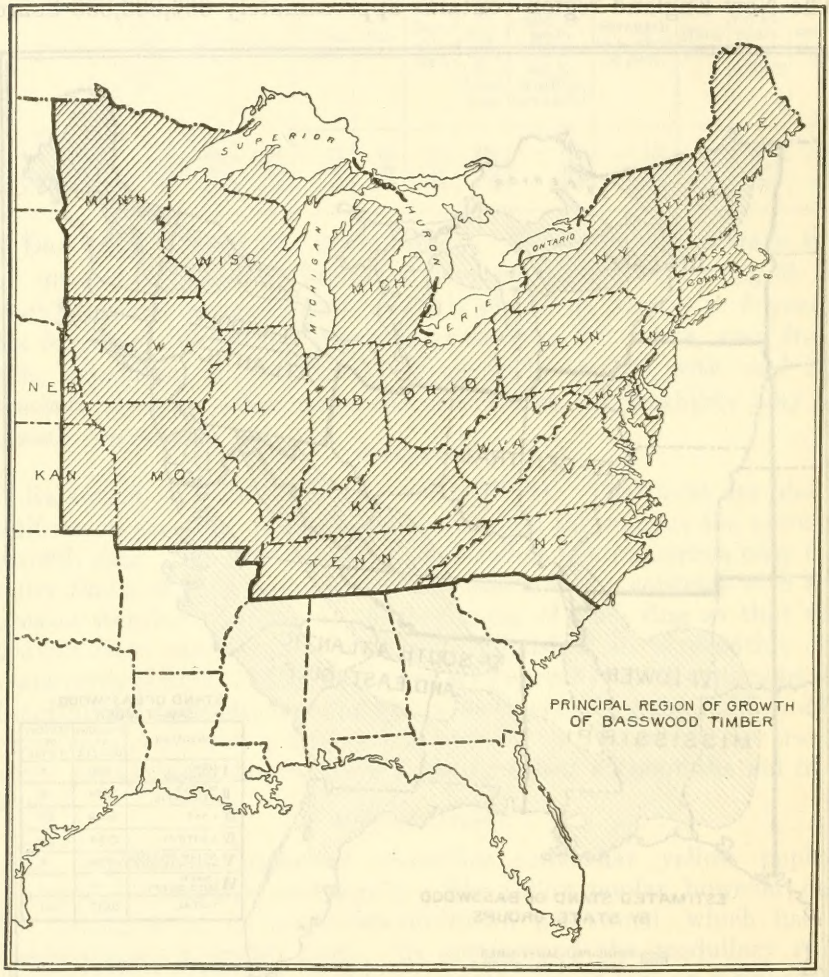


FIG. 2.—Principal region of growth of basswood timber (shaded area).

ANNUAL DRAIN ON THE SUPPLY.

The total present annual demand for basswood timber is difficult to determine, because of a lack of statistics for some of the industries using basswood logs as raw material. The total basswood lumber production for 1920 is placed at 195,000,000 board feet. Reports on veneer production in 1919, which are the latest available data, give 11,134,000 board feet, log scale, of basswood consumed in that year,

equivalent to about 13,000,000 board feet of lumber. In 1911, 33,042 cords of basswood were reported for excelsior, equivalent to about 16,500,000 board feet of lumber. Whether amounts now consumed are greater or less than these figures, and how much, can not be stated with certainty, because, although the demand for products of basswood from these industries has increased greatly, the supply of the timber has been more restricted in recent years. It is not safe, therefore, to assume any increase over these figures, especially since the sawmill cut of basswood lumber has suffered a considerable reduction during the period. Constant inroads have been made into the remaining stands of basswood to fulfill the increased demand. Smaller and in some cases second-growth timber has been cut so that both quantity and quality have been lowered.

Pulpwood statistics are available for the year 1920. The basswood reported as used for pulpwood during that year totaled 10,469 cords, equivalent to about 5,000,000 board feet of lumber. The number of sets of basswood slack-cooperage heading reported manufactured during the year 1919 was 3,078,000, equivalent to a little more than 6,000,000 board feet of lumber. These different items, which make up practically the entire demand for basswood timber, total about 235,000,000 board feet. It is probable, therefore, that the present annual drain upon the supply amounts to between 225,000,000 and 250,000,000 board feet. Assuming it is 250,000,000 board feet, the aggregate stand of basswood saw timber shown in figure 1 (9,012,000 board feet) without taking into consideration the growth that may take place during the period, will last approximately 40 years. If we are to continue using basswood provision will have to be made for growing trees to take the place of those cut. Natural growth not protected from fires while young will not fill the requirement gap toward the close of the 40-year period.

Little basswood is used for rough building construction, because it is not so strong as many lower-priced structural timbers, and it is not satisfactory in locations favorable to decay. Also, comparatively small quantities are used for fuel, because its heating value is low compared with other woods, such as beech and oak. Reports from wood-using industries of the United States obtained during the years 1909 to 1913 show an annual consumption of approximately 370,000,000 board feet of basswood lumber by factories. Adding to this the timber used for veneer, excelsior, pulpwood, and slack cooperage, brings the total to over 400,000,000 board feet, compared with 225,000,000 or 250,000,000 board feet, the probable present amount used. Evidently there has been a considerable reduction in the amount of basswood used during the past 10 years.

THE FUTURE OF BASSWOOD TIMBER.

The future of basswood depends upon provision made for new growth. Basswood is a very desirable tree to grow especially for the small timber owner who has a tract of woodland which he wishes to keep permanently forested. It is easily propagated, increases in size rapidly in comparison with other species, and is marketable in various forms. Rapid-growth timber yields the largest amount of the white sapwood, which is highly valued.

The tree grows well on deep, fresh or sandy loams, and has been known to grow rapidly and thriftily on very porous upland soils. It is generally a hardy tree, although on heavy upland soils it not only grows slowly but is likely to suffer injury during dry periods. The most favorable region for its growth is the northeastern part of the United States. In the virgin forest, basswood often reaches a height of 90 to 100 feet and a trunk diameter of 3 or 4 feet. When crowded by other trees it forms a straight stem, with but few branches, which are near the top (Pl. II); but when grown in the open the stem is short and there are many large branches.

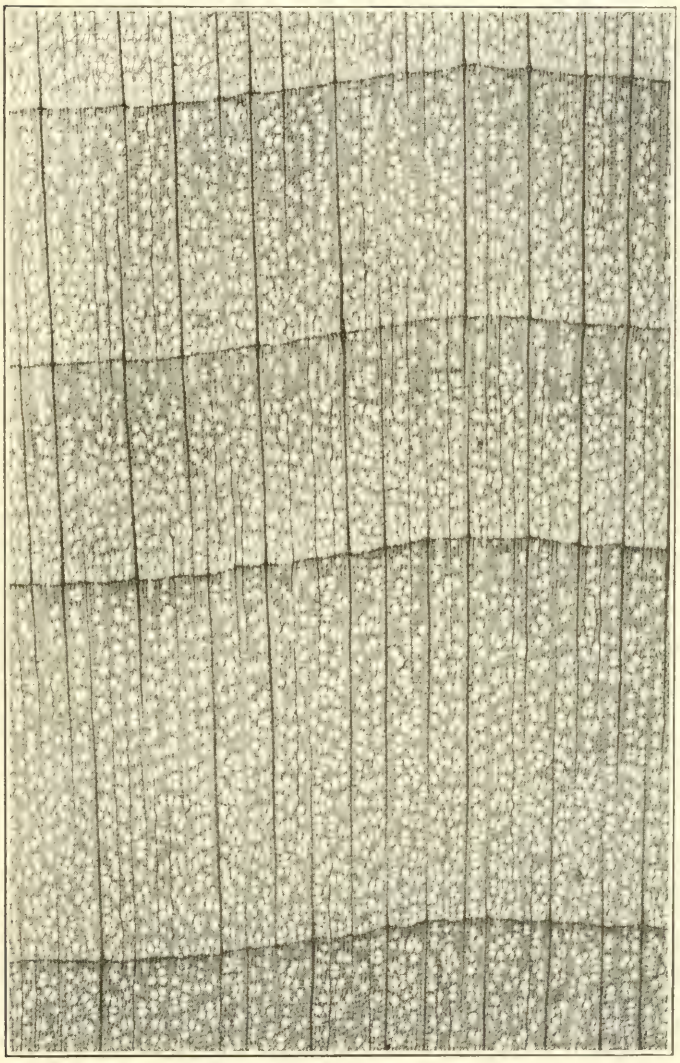
Basswood is one of the most prolific of our native trees in its sprouting capacity. The sprouts arise from the stump and afford a practical means of renewing basswood as a timber crop (Pl. III). To obtain vigorous sprouts the trees should be felled between November and March. The stumps should be cut low, so that the sprouts will start close to the ground, where they can soon develop a root system of their own and become self-supporting; otherwise, decay from the stump of the old tree is likely to enter them. Sprouts generally grow more rapidly than seedlings. For the production of small-diameter material, such as excelsior and pulpwood bolts, propagation by sprouting affords an excellent method of obtaining a timber crop in a comparatively short time.

The tree generally does not suffer severe injury from insect attack. Cattle like to browse upon the young twigs and leaves, however, and should be excluded from the young growth.

UTILIZATION BY INDUSTRIES.[2]

Wood-using industries generally belong in one of two classes, based on the form of raw material used: (1) Those which depend entirely upon the log or bolt, and (2) those which use mainly lumber or dimension stock for further manufacture into various products. The former class is termed primary and the latter secondary.

[2] Because of the low fuel value of the wood, basswood stands are of relatively inferior value as a source of firewood. As a shade tree and for ornamental planting, basswood is well liked because of its large crown and dense foliage. The tree is also valued very highly by beekeepers for the flowers, which are borne in great profusion. Honey made from basswood flowers is light-colored and of excellent quality; it generally goes under the name of poplar honey and brings a comparatively high price in the market.



CROSS SECTION OF BASSWOOD TIMBER MAGNIFIED 20 DIAMETERS.

LARGE BASSWOOD TREE CLEAR OF BRANCHES BUT AFFECTED WITH ROT FOR 20 TO 30 FEET UP AS INDICATED BY SWOLLEN BUTT

THRIFTY BASSWOOD TREE WITH SEVERAL LARGE SPROUTS.

DEFECTS COMMONLY FOUND IN BASSWOOD TIMBER: A, END OF BASSWOOD LOG SHOWING DISCOLORED CENTRAL PORTION.

b, *c*, *d*, *e*, boards showing most common defects, dark and discolored wood, rotten streaks, and knots.

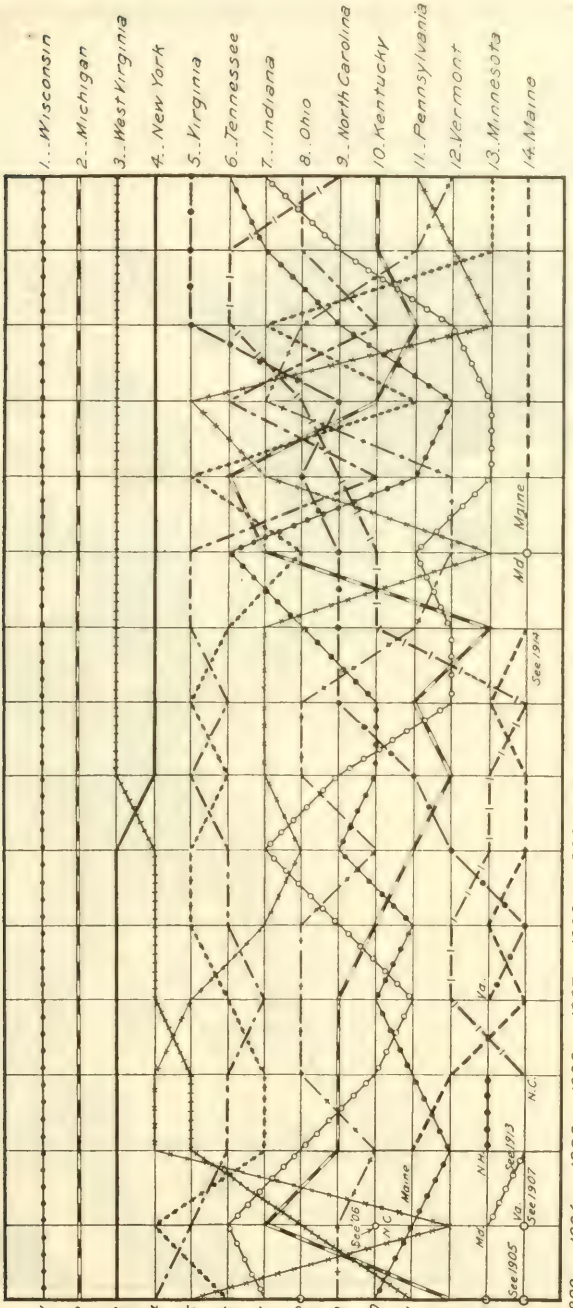


FIG. 3.—Rank of different States in manufacture of basswood lumber 1899–1918.

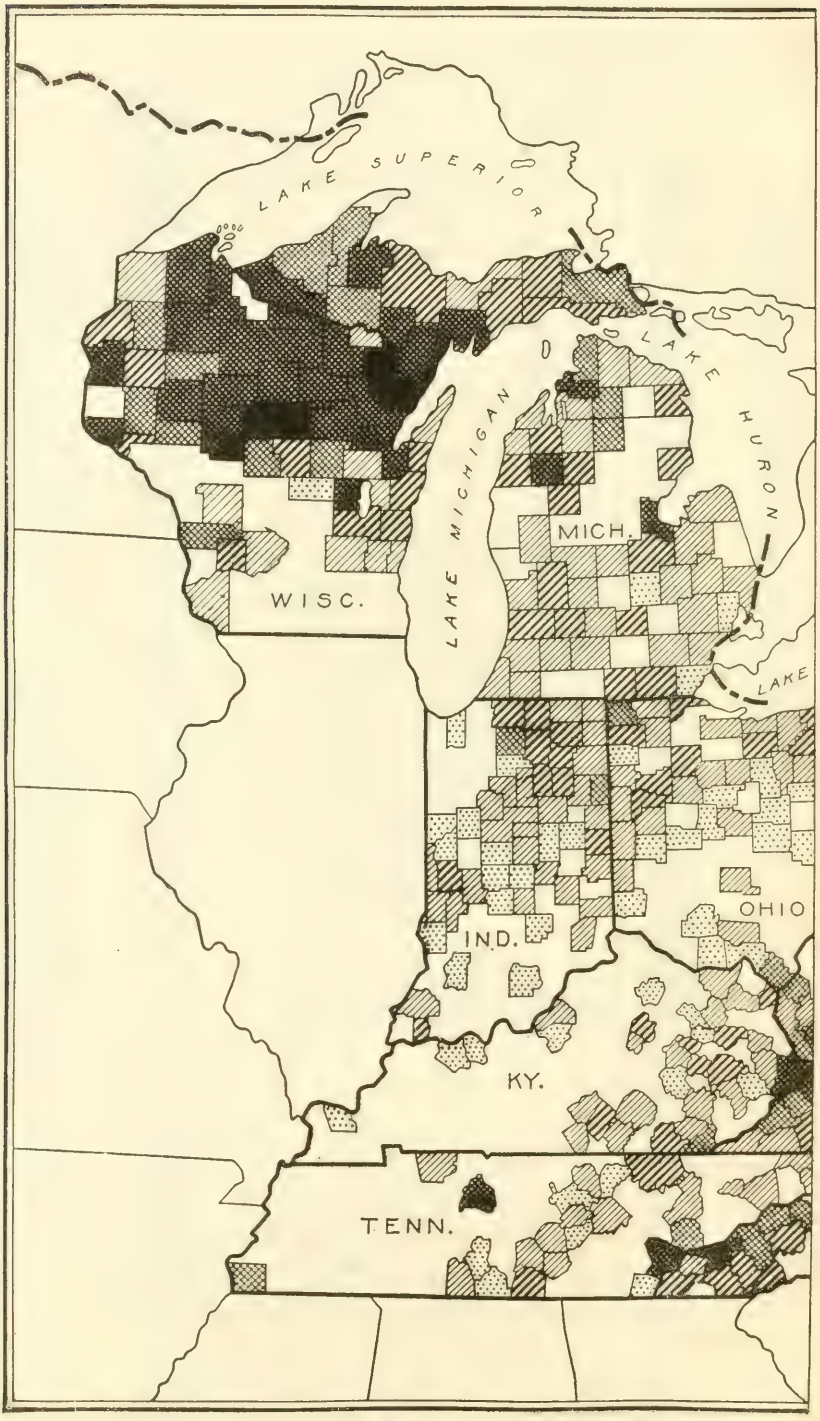

LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE
MICH.
WISC.
OHIO
IND.
KY.
TENN.

FIG. 4.

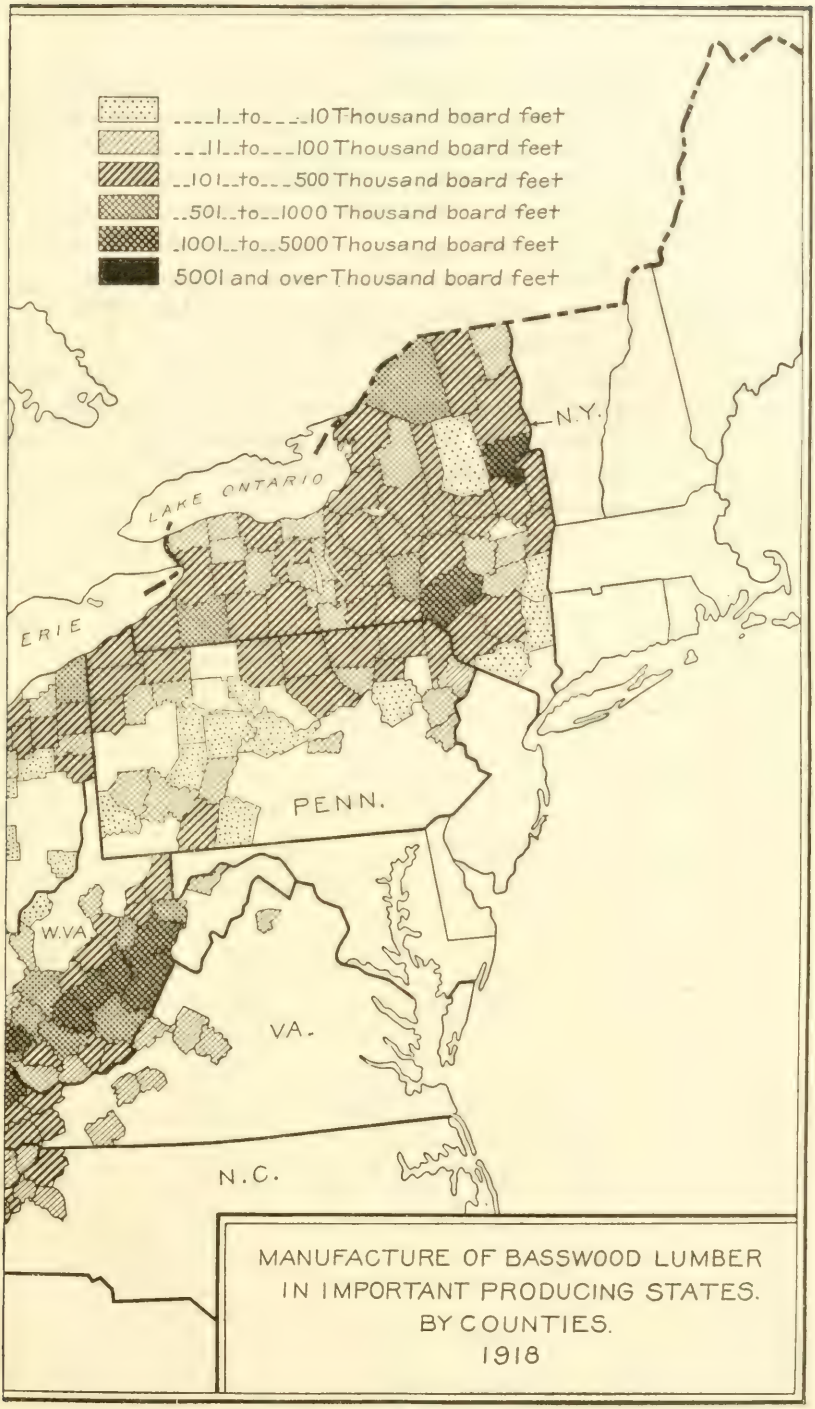

1 to 10 Thousand board feet
11 to 100 Thousand board feet
101 to 500 Thousand board feet
501 to 1000 Thousand board feet
1001 to 5000 Thousand board feet
5001 and over Thousand board feet
N.Y.
LAKE ONTARIO
ERIE
PENN.
W.VA.
VA.
N.C.
MANUFACTURE OF BASSWOOD LUMBER
IN IMPORTANT PRODUCING STATES.
BY COUNTIES.
1918

FIG. 4.

PRIMARY INDUSTRIES.

LUMBER.

Statistics on production.—Statistics on the annual production of basswood lumber are available for the year 1899 and for the years 1904 to 1920, inclusive. These data are given in Table 3, by States.

According to this table the 1920 production was only about one-half that of the annual production from 1906 to 1909, when the maximum cut of basswood lumber was reached. The figures for the different years are not all directly comparable, because in some years more of the smaller mills were included, as noted in the table. For several years, Wisconsin, Michigan, West Virginia, and New York have produced the largest quantities. In 1918 more than three-fourths of the total reported lumber cut of basswood was from these four States. Figure 3 shows the rank of the different States in lumber production in different years. Figure 4 shows the 1918 lumber production by counties.

TABLE 3.—*Reported annual production of basswood lumber, by States, in 1899, and from 1906 to 1920, inclusive (1,000 board feet), average value of the product, f. o. b. mills, and total number of mills reporting.*

Data.	1899	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
Total number of mills reporting	31,833	22,398	28,850	31,231	[2] 46,584	[1] 31,934	[1] 28,107	[1] 29,648	[1] 21,668	[1] 27,506	[1] 16,815	[1] 17,269	[1] 16,420	[1] 14,753	[2] 29,534	15,978
Total number of mills cutting basswood	([3])	([3])	[4] 3,888	[4] 4,326	6,973	5,423	5,130	5,217	3,336	([3])	2,889	2,668	2,548	2,102	2,202	2,372
Average value per 1,000 board feet, f. o. b. mill	$12.84	$18.66	$20.03	$20.50	$19.50	$20.94	$19.20	$19.26	([3])	([3])	$18.89	$21.05	$25.96	$34.00	$40.03	$54.28
Computed total cut											260,000	275,000	203,000	200,000		195,000
Total reported cut	308,069	376,838	381,088	319,505	399,151	344,704	304,621	296,717	257,102	264,656	207,607	209,275	190,757	174,661	183,562	169,276
Wisconsin	177,903	162,155	147,938	110,364	133,887	133,061	95,249	79,389	91,670	92,077	73,929	72,618	67,787	72,462	69,545	59,067
Michigan	45,796	73,458	60,859	49,832	69,453	59,899	47,572	53,533	39,265	43,568	28,718	36,756	38,427	29,788	33,532	23,562
West Virginia	1,872	17,480	26,904	19,632	29,679	28,936	36,213	32,986	31,623	31,992	26,956	28,955	21,098	17,195	15,206	19,369
New York	29,867	28,850	39,564	40,446	36,058	23,403	29,638	28,513	24,818	24,370	18,114	14,630	12,240	12,265	10,983	14,834
Virginia	401	1,684	3,384	3,700	9,658	8,012	8,809	9,343	6,231	7,779	5,131	7,030	6,925	5,895	7,591	7,258
Tennessee	2,331	8,274	8,463	6,408	11,463	8,500	8,354	9,460	8,703	7,257	4,668	5,107	6,251	5,013	4,353	4,953
Indiana	7,292	8,547	8,295	8,889	13,917	8,916	7,455	7,389	5,615	5,268	4,122	4,828	4,859	4,805	4,265	4,662
Ohio	12,512	12,718	14,480	16,282	16,007	15,116	11,482	14,920	8,784	7,288	7,914	5,049	5,251	4,775	7,363	4,940
North Carolina	273	2,020	5,079	3,891	6,387	6,079	4,273	8,128	6,180	7,447	6,129	7,028	6,570	4,718	5,071	7,616
Kentucky	1,453	9,436	8,609	8,091	10,056	7,340	8,214	6,986	8,404	8,692	4,979	4,833	4,698	4,249	4,671	4,303
Pennsylvania	10,073	17,932	18,835	13,502	13,008	11,568	11,303	10,925	5,237	8,324	8,075	4,194	4,391	3,437	5,681	4,417
Vermont	2,852	9,482	10,276	9,161	10,478	9,421	9,217	7,957	5,317	5,273	6,200	5,868	4,530	3,286	6,660	4,308
Minnesota	7,941	10,743	15,365	17,111	20,131	13,582	13,846	13,713	8,084	9,685	4,939	5,985	3,832	2,968	5,113	5,412
Maine	901	4,485	3,349	3,864	4,123	2,635	4,394	5,499	1,578	1,980	1,941	1,517	807	1,095	1,164	867
Maryland	140	1,674	608	1,063	2,386	580	1,743	1,157	1,978	692	1,236	896	393	677	7	166
New Hampshire	162	2,355	2,444	1,737	2,328	2,239	1,759	1,493	576	702	726	730	536	675	575	653
Iowa	4,302	1,435	2,572	1,843	4,111	1,869	2,103	2,257	1,296	574	1,754	1,393	896	507	788	947
Massachusetts	300	1,186	1,030	1,219	1,286	695	720	736	311	946	369	316	276	226	131	303
Connecticut	78	1,240	1,002	496	745	739	762	433	394	170	111	136	111	188	40	327
Arkansas	10	550	60	362	605	368	90	152	10	11	36	383	229	119	17	90
Illinois	243	434	647	303	587	357	102	90	118	19	51	106	103	101	44	59
Missouri	1,332	230	594	546	1,090	609	458	467	204	171	102	246	253	73	28	147
Georgia	35	35	125	104	88	118	60	277	300	60	115	285		47	82	50
Alabama			336	259	564	461	425	560	141	275	140	183	176	32	12	19
Louisiana		11	58			53	53	117	102	30	830	36	126	23		229
Texas		(a)		7	97	20	116		115		47	61		16		32
New Jersey		414	37	9	356	59	65	26	12		25	14	4	13		5
Oklahoma				37	(a)			152		5	100	50		12	1	78
Mississippi			70	207	591	54	125	23	28	(a)	150	50			449	603
All other States [5]		1	105	50	2	15	21	36	8	1		15	8		100	

[1] Mills cutting less than 50,000 feet excluded.
[2] Includes 4,543 mills cutting less than 50,000 feet in 1909 and 2,655 in 1919.
[3] Data not obtained.
[4] Mills in New York not included.
[5] Includes Kansas, Rhode Island, South Carolina, Florida, Delaware, and those marked "a."

TABLE 4.—*Number of mills in the different States reporting manufacture of basswood lumber in different years arranged in order of lumber cut for 1918.*

State.	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
Total.....	[1]3,888	[1]4,326	6,973	5,423	5,130	5,217	3,336	3,129	2,889	2,668	2,548	2,102	2,202	2,372
Wisconsin....	573	627	763	631	538	572	375	298	286	269	273	259	251	225
Michigan.....	535	548	737	583	517	486	277	189	213	217	197	162	158	154
W. Virginia..	274	295	422	348	340	326	165	240	191	187	161	141	137	138
New York...	[2]	[2]	1,323	948	1,067	1,025	1,183	1,008	848	708	638	539	532	679
Virginia.....	(a)	98	174	171	147	107	74	61	55	57	73	57	56	56
Tennessee....	146	173	191	143	151	146	99	126	71	59	82	63	(a)	70
Indiana.....	298	294	392	249	231	250	121	137	142	142	128	100	(a)	122
Ohio.....	321	404	575	447	393	460	205	198	191	174	174	138	141	165
N. Carolina..	(a)	125	180	141	122	153	65	71	56	87	87	65	(a)	66
Kentucky....	175	191	215	207	160	152	130	162	89	99	82	65	(a)	99
Pennsylvania	500	468	508	379	378	430	174	219	220	195	196	140	(a)	153
Vermont.....	259	260	280	280	279	279	128	143	177	163	174	117	(a)	127
Minnesota....	188	230	352	264	240	251	124	88	73	66	70	77	(a)	104
Maine.....	(a)	135	144	118	136	154	56	60	82	74	55	44	(a)	(a)
Maryland....	(a)	18	44	22	18	17	10	6	7	8	5	6	(a)	(a)
N.Hampshire	(a)	108	93	86	77	83	17	34	48	40	31	30	(a)	(a)
Iowa.....	(a)	77	181	111	98	109	46	13	49	41	42	28	(a)	(a)
Massachusetts	(a)	74	93	60	51	52	17	22	29	26	19	22	(a)	(a)
Connecticut..	(a)	54	58	58	46	36	14	15	15	10	12	12	(a)	(a)
Arkansas.....	(a)	12	27	12	11	9	(a)	3	(a)	3	7	9	(a)	(a)
Illinois.....	(a)	42	48	32	21	17	12	5	5	10	9	4	(a)	(a)
Missouri.....	(a)	47	111	89	69	64	23	17	16	13	17	9	(a)	(a)
Georgia.....	(a)	19	11	14	8	6	3	(a)	(a)	3	.....	(a)	(a)	(a)
Alabama.....	(a)	8	16	17	17	19	7	11	8	5	9	(a)	(a)	(a)
Louisiana....	(a)	.....	.....	(a)	(a)	(a)	(a)	(a)	4	(a)	4	(a)	(a)	(a)
Texas.....	.....	(a)	2	(a)	(a)	.....	3	.....	(a)	(a)	.....	3	(a)	(a)
New Jersey..	(a)	4	16	7	7	5	(a)	.....	5	4	(a)	3	(a)	(a)
Oklahoma....	.....	3	(a)	.....	.....	(a)	.....	.....	(a)	(a)	.....	(a)	(a)	(a)
Mississippi...	(a)	10	16	3	3	(a)	(a)	(a)	3	(a)	.....	(a)	(a)	(a)
All other [3]....	619	2	1	3	5	9	8	3	6	8	3	9	927	214

[1] Not including mills in New York.
[2] Not reported.
[3] Including Florida, Kansas, Rhode Island, South Carolina, and those marked "a."

TABLE 5.—*Percentage of basswood lumber manufactured by different classes of mills in 1918, also number of mills in different classes reporting.*

[Class 5 includes mills cutting 10,000,000 board feet and over per year; class 4, mills cutting from 5,000,000 to 9,999,000 board feet per year; class 3, 1,000,000 to 4,999,000 board feet; class 2, 500,000 to 999,000 board feet; class 1, 50,000 to 499,000 board feet.]

State.	Total.		Class 5.		Class 4.		Class 3.		Class 2.		Class 1.	
	Amount per cent.	Number of active mills reporting.	Amount per cent.	Number of mills.	Amount per cent.	Number of mills.	Amount per cent.	Number of mills.	Amount per cent.	Number of mills.	Amount per cent.	Number of mills.
United States.....	100	2,102	40	104	19	121	18	267	9	327	14	1,283
Wisconsin.....	100	259	59	40	13	21	15	42	6	34	7	122
Michigan.....	100	162	62	28	26	31	7	22	1	8	4	73
West Virginia.....	100	141	30	15	38	24	22	31	5	26	5	45
New York.....	100	539	0	0	1	3	17	20	24	67	58	449
Virginia.....	100	57	.....	1	[1] 72	9	13	8	9	17	6	22
Tennessee.....	100	63	43	5	34	9	13	11	3	5	7	33
Indiana.....	100	100	0	0	.....	1	[2] 78	32	10	17	12	50
Ohio.....	100	138	0	0	.....	2	[3] 35	20	42	36	23	80
North Carolina.....	100	65	14	3	35	8	28	13	12	10	11	31
Kentucky.....	100	65	.....	2	[4] 26	5	43	11	18	14	13	33
Pennsylvania.....	100	140	16	3	10	4	20	12	20	29	33	92
Vermont.....	100	117	0	0	0	0	17	8	27	30	55	79
Minnesota.....	100	77	.....	1	.....	1	[5] 20	4	4	6	76	65
All other States.....	100	179	2	6	14	3	26	33	23	28	35	109

[1] Includes cut of 1 mill in class 5.
[2] Includes cut of 1 mill in class 4.
[3] Includes cut of 2 mills in class 4.
[4] Includes cut of 2 mills in class 5.
[5] Includes cut of 1 mill in class 5 and 1 mill in class 4.

Table 4 gives the number of mills in the different States reporting the manufacture of basswood lumber in different years. New York, Pennsylvania, Vermont, Ohio, and Indiana produce relatively small amounts in proportion to the number of mills cutting basswood. Wisconsin and, to a lesser degree, Michigan produce relatively large amounts per mill cutting basswood.

Table 5 shows the proportionate amounts of basswood lumber manufactured by different size-classes of mills in different States in 1918. There has been a great reduction in the number of mills sawing basswood lumber for the last few years, particularly in Ohio, Indiana, and Pennsylvania, which indicates that the timber is largely cut out in those States.

Manufacture.—In sawing basswood lumber from the log, manufacturers generally try to get wide, clear stock, for which there is a demand. Such stock 2½ and 3 inches in thickness is often wanted for special uses. Basswood lumber that is all white brings a better price than when the brown wood is mixed with it.

Practically all basswood logs have a discolored central portion (Pl. IV, a), and lumber manufacturers generally saw as much wide, clear, white stock as possible from two sides of the log down to the discolored wood. Narrower stock is then sawed from the other two sides. Logs with large hollow or defective centers are sawed similarly. Such logs will yield as much according to the log scale as sound logs, because, in scaling, the central defective portion is deducted. The sound wood in such a log is often entirely clear; and, since the whiter wood is toward the outside, these logs generally produce a large percentage of high-grade stock. Probably the most common thicknesses of basswood lumber manufactured are 1, 2½, and 3 inches.

The quantities of different grades of basswood lumber sawed from logs naturally depend on the size and quality of the timber. Reports from several large mills in northern Michigan and Wisconsin indicate that the average proportions of different grades of basswood lumber produced are about as follows:

Grades:	Per cent.
Firsts and seconds	25
No. 1 common	30
No. 2 common	25
No. 3 common	20

The principal defects found in basswood lumber are black and rotten streaks and rotten knots (Pl. IV, b, c, d, e). Basswood timber has few knots, however, in comparison with most other hardwoods. The dark, brown-colored wood near the center of the log is not valued so highly as the light-colored wood, even though it may be perfectly sound and clear of defects (Pl. IV, a, b). Discoloration also often takes place in the white wood, which reduces its value. This

discoloration does not take place so readily in cold weather, and for this reason basswood is cut by some firms mainly in the winter or late fall. Some manufacturers claim that where the lumberyard is kept in proper condition, well drained and free from undergrowth, there is little trouble from the staining of basswood, whether cut in winter or summer. It is a common practice not to separate the white basswood from the brown until it has been air-dried for 6 summer months. The "stickers," or strips, used in piling lumber to keep the boards apart for drying may leave a discolored strip or band in basswood which is not removed in planing and lessens the value of the white wood for certain purposes. This is overcome by some firms by end-drying the lumber or pole-drying it for a week or two and then placing it in a "stuck" pile. In end-drying, the boards are placed on end under a specially built shed with stickers arranged horizontally at specified distances. Such a pile presents the appearance of an ordinary lengthwise lumber pile set on end. In this method the stickers are not brought into such close contact with the boards, since there is no weight or pressure. In pole-drying, the boards are piled almost vertically, crossing each other and supported by a strip of timber on which the lower edge of each board rests (Pl. V, figs. 1 and 2). Labor costs are greater in pole-drying than in the ordinary methods of piling lumber.

Basswood logs are very closely utilized in manufacturing into lumber, especially the outer clear, white, sound wood. Even the strips edged from the boards and called "bark strips" are often piled together and placed in stock. These bark strips are generally 1 inch thick and 2 to 4 inches wide, although some may be as wide as 6 inches. If of good color and free from defects, this stock is valuable to factories making small articles. Small strips of low-grade wood about 3 feet in length are sometimes sawed out and sold for crating.

Sawmill operators generally find it more profitable to manufacture lumber from their basswood logs than to sell the logs to factories.

Grades and prices.—Basswood logs are often separated into two grades, No. 1 or veneer logs, and No. 2, which is below the No. 1 grade. Veneer logs must be quite clear and of good form for rotary cutting. They must be at least 11 inches in diameter at the small end. No. 2 logs can be as small as 6 inches in diameter at the small end.

The National Hardwood Lumber Association grading rules for basswood lumber apply also to soft elm, soft maple, and buckeye. There are six grades: Firsts, seconds, selects, No. 1 common, No. 2 common, and No. 3 common.

Firsts must be 6 inches and over wide, 8 feet and over long. Pieces 4 to 9 square feet in size, surface measure, must be clear; pieces 10 to 15 square feet may have one standard defect or its equivalent; and

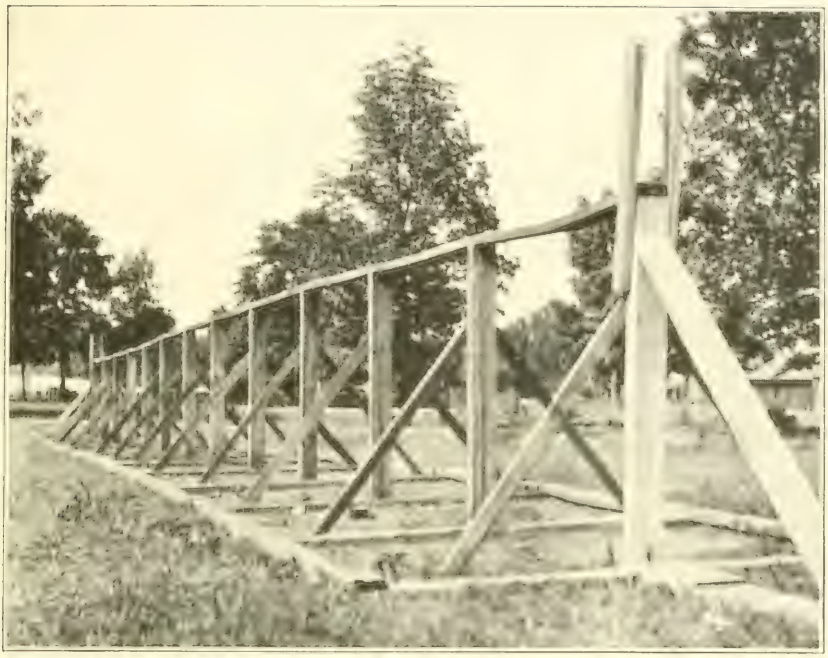


FIG. 1.—FRAMEWORK USED IN POLE DRYING.

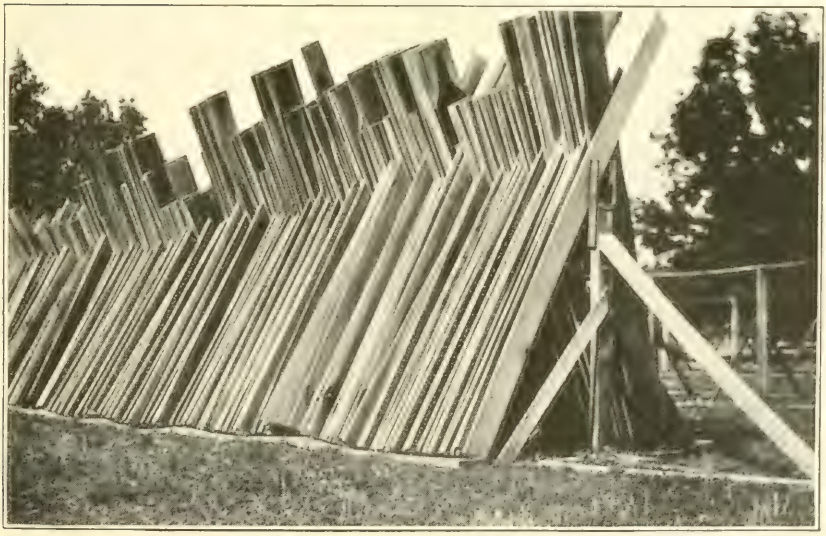


FIG. 2.—METHOD OF POLE-DRYING BASSWOOD LUMBER.

A Wagon Load of Basswood Logs Quite Clear and Fairly Straight, Suitable for Manufacture into Veneer. About 300 Board Feet of Logs Makes a Good Load.

pieces 16 square feet and over may have two standard defects or their equivalent. Seconds are also 6 inches and over wide, and pieces can have from one to five standard defects or their equivalent for from 5 to 20 square feet, surface measure, as specified. Firsts and seconds are generally combined as one grade, called "firsts and seconds" and designated as FAS. In this combined grade there must be at least 20 per cent of firsts. Lengths are 8 to 16 feet, and there must be not more than 20 per cent under 12 feet long and not more than 10 per cent 8 and 9 feet long.

The grade "selects" includes pieces 4 inches and over wide and 6 feet and over long, with not more than 30 per cent under 12 feet long and not over 5 per cent of 6 and 7 foot lengths. In general the best face of pieces in selects must grade not below seconds and the reverse face not below No. 1 common. Admission into this grade also depends on amount of waste caused by defects in each piece.

Nos. 1, 2, and 3 common grades include pieces 3 inches and over wide and 4 feet and over long. No. 1 common must have not to exceed 5 per cent of 3-inch widths, with not over 30 per cent shorter than 10 feet, and not to exceed 10 per cent of 4 and 5 foot lengths. Pieces 4 and 5 feet long, also pieces 3 and 4 inches wide and 6 and 7 feet long, must be clear of defects. Other pieces must work at least 66⅔ per cent clear face in from one to four cuttings of specified minimum sizes, depending on the dimensions of the pieces. No. 2 common must have not more than 10 per cent of 4 and 5 foot lengths. Pieces must work at least 50 per cent sound in not more than three to five cuttings, depending on the size of the piece. Cuttings must be at least 3 inches wide by 2 feet long. Pieces in No. 3 common grade must contain at least 25 per cent of sound cuttings, each of which must have a minimum width of 1½ inches and a minimum surface area of 36 square inches. It is specifically noted in these rules that black spots and black streaks are defects in all grades, and care must be exercised in estimating their damage, for if any piece has an excessive amount its grade will be lowered.

Table 6 gives average stumpage values of basswood timber for the years 1907 and 1912. These are averages of reports from a large number of timberland owners. Table 7 gives prices based on many reports of actual sales of stumpage in 1912. Prices of maple, birch, and beech are included for comparison. Reports obtained on stumpage sales in 1920 indicate a considerable increase in prices. Selling prices for Michigan and Wisconsin averaged $10, and an average selling price of $19.40 was reported on sales of basswood stumpage in Ohio. This high figure for Ohio probably includes small lots of choice timber. Reports on sales in States where the timberland has been largely cut over show much variation in price. Basswood is generally purchased together with other hardwood timber, such as

yellow poplar, maple, and oak, with which it is found in mixture, and the price varies greatly. Prices ranging from $2.50 to $10 a thousand board feet for mixed stands were reported from Kentucky, Tennessee, and West Virginia. The average value of basswood lumber per 1,000 board feet f. o. b. mills, obtained from reports of sawmills on lumber production, is given in Table 8, by States, for those years in which the data were collected. With the exception of the years 1909, 1911, and 1915, this table shows a continuous increase in value; increasingly higher values are shown since the year 1915. Average prices in Kentucky, Tennessee, and North Carolina are generally $1 or $2 a thousand board feet below the average.

TABLE 6.—*Average stumpage values of basswood for 1907 and 1912, from reports on values from timberland owners.*

	1907	1912
Northeastern States:		
Maine	$5.80 (20)	$6.04 (48)
New Hampshire	6.25 (18)	7.56 (23)
Vermont	4.96 (27)	6.90 (25)
New York	8.31 (21)	8.51 (88)
Pennsylvania	7.59 (41)	8.14 (61)
Average of 5 States	6.68 (127)	7.68 (245)
North Central States:		
Ohio	9.59 (27)	11.59 (59)
Indiana	10.83 (27)	11.22 (43)
Average of 2 States	10.21 (54)	11.43 (102)
Southern Appalachian States:		
Maryland	4.50 (3)	4.50 (4)
Virginia	3.33 (6)	6.33 (4)
West Virginia	3.91 (43)	4.11 (9)
Kentucky	4.46 (3)	4.62 (25)
Tennessee	4.04 (12)	4.22 (18)
North Carolina	1.67 (6)	3.30 (23)
Average of 6 States	3.75 (73)	4.16 (82)
Lake States:		
Michigan—		
Upper Peninsula	5.61 (23)	.....
Lower Peninsula	8.95 (59)	.....
Southern tier of counties	1.67 (6)	.....
State average	8.26 (88)	9.57 (86)
Wisconsin	6.59 (65)	7.12 (122)
Minnesota	5.50 (10)	7.41 (39)
Average of 3 States	7.42 (163)	8.02 (247)

The numerals in parentheses indicate the number of reports on which the averages are based. (From Department of Agriculture Bulletin 285, The Northern Hardwood Forest, Table 12.)

TABLE 7.—*Comparative stumpage values per 1,000 board feet of basswood, maple, birch, and beech, 1912.*

[From reports of sales collected by the Forest Service.]

Species.	Northeastern States.[1]	Southern States.[2]	Lake States.[3]
Basswood	$8.40	$4.92	$6.30
Maple	5.98	3.45	4.58
Birch	5.61	3.33	4.85
Beech	4.38	2.86	3.67

[1] Maine, New Hampshire, Vermont, Massachusetts, New York, and Pennsylvania.
[2] Maryland, Virginia, West Virginia, Kentucky, Tennessee, and North Carolina.
[3] Minnesota, Wisconsin, and Michigan.

TABLE 8.—*Average value of basswood lumber per 1,000 board feet f. o. b. mills, by States, for different years.*

	1899	1904	1907	1909	1911	1915	1916	1917	1918	1919	1920
United States	$12.84	$16.86	$20.03	$19.50	$19.20	$18.89	$21.05	$25.06	$34.00	$40.03	$54.28
Wisconsin	12.67	16.12	19.62	18.97	19.03	18.94	21.15	26.60	34.68	39.78	57.05
Michigan	13.08	17.29	20.31	21.16	20.17	19.57	22.07	27.74	36.04	42.38	56.65
West Virginia	12.10	18.09	19.60	20.07	18.56	19.13	20.82	25.43	35.34	40.86	60.81
New York	14.24	17.76	24.00	17.88	20.81	19.50	22.98	25.48	33.12	40.36	50.44
Virginia	10.21	20.10	19.15	18.27	15.83	18.81	21.18	25.65	36.13	37.54	64.16
Tennessee	10.09	14.97	17.86	19.28	19.80	17.26	19.76	25.21	32.00	.....	52.87
Indiana	14.74	32.71	22.27	24.38	20.40	21.31	22.80	27.49	34.13	.....	53.24
Ohio	12.21	18.21	20.70	22.82	20.36	19.39	22.07	25.84	32.34	40.17	50.14
North Carolina	12.34	10.13	17.74	16.57	19.33	18.24	19.83	22.96	30.09	.....	44.81
Kentucky	9.79	13.20	18.69	18.11	19.19	18.46	18.07	23.41	28.94	.....	42.36
Pennsylvania	13.34	20.72	20.20	21.63	20.23	17.30	20.52	23.69	29.33	.....	53.59
Vermont	12.65	16.37	17.26	17.07	19.22	17.71	19.27	23.68	32.33	.....	44.88
Minnesota	10.63	13.10	17.72	17.10	15.67	16.10	17.15	19.45	23.11	.....	38.69
Maine	11.09	15.42	18.36	17.02	18.00	17.13	17.67	20.54	18.82	.....	.....
Maryland	11.57	18.67	17.09	15.96	16.00	20.00	18.14	29.16	30.19	.....	.....
New Hampshire	9.68	18.56	17.47	16.20	19.33	17.66	18.34	22.00	31.30	.....	.....
Iowa	13.12	16.97	19.37	19.53	18.79	19.41	20.73	23.02	25.53	.....	.....
Massachusetts	9.98	11.00	17.61	16.71	18.79	15.21	18.07	20.38	26.49	.....	.....
Connecticut	26.28	12.00	18.24	17.88	18.50	17.88	19.01	16.86	22.46	.....	.....
Arkansas	10.00	.....	17.10	21.94	.....	20.00	20.38	18.21	21.22	.....	.....
Illinois	13.19	23.75	19.74	16.94	19.00	18.75	17.30	20.79	32.50	.....	.....
Missouri	11.18	14.33	14.38	16.61	14.62	16.88	17.87	18.42	23.33	.....	.....
Georgia	10.71	.....	12.68	15.02	17.33	20.09	18.18	.....	35.00	.....	.....
Alabama	.....	10.12	18.72	19.93	18.50	18.36	21.37	20.61	25.06	.....	.....
Louisiana	.....	.....	20.69	.....	.....	16.37	16.61	16.59	18.48	.....	.....
Texas	.....	.....	.....	18.00	.....	18.00	18.75	.....	26.44	.....	.....
New Jersey	.....	16.00	23.54	26.75	.....	19.60	16.00	30.00	25.00	.....	.....
Oklahoma	.....	.....	.....	16.50	.....	15.00	14.00	.....	27.67	.....	.....
Mississippi	.....	.....	22.50	18.38	.....	.....	15.50	.....	22.00	.....	.....
South Carolina	.....	19.25	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rhode Island	.....	.....	13.95	.....	.....	.....	.....	.....	.....	.....	.....
Kansas	.....	.....	.....	.....	.....	.....	18.75	.....	.....	.....	.....
Florida	.....	.....	.....	.....	.....	.....	.....	35.00	.....	.....	.....

TABLE 9.—*Average wholesale prices of basswood lumber per thousand board feet f. o. b. mill in Wisconsin and Michigan, by grades, for different years.*

	1909	1910	1911	1912	1913	1914	1915	1916
Wisconsin:								
Firsts and seconds 4/4	$35.72	$34.66	$33.81	$34.51	$37.45	$36.20	$33.79	$36.08
No. 1 common 4/4	24.93	23.97	23.85	23.58	24.97	24.68	22.95	25.07
No. 2 common 4/4	14.98	14.31	13.76	16.04	19.50	17.94	15.61	17.18
No. 3 common 4/4	11.96	.....	.....	.....	17.30	15.51	13.05	13.99
Mill run	21.72	21.45	19.03	18.81	25.05	20.95	19.38	.....
Michigan:								
Firsts and seconds 4/4	36.34	35.87	36.37	35.82	37.78	36.48	35.27	37.88
No. 1 common 4/4	26.29	25.88	25.46	24.87	27.11	26.63	25.05	27.67
No. 2 common 4/4	18.24	17.19	16.54	16.68	19.69	19.66	18.33	18.55
No. 3 common 4/4	13.92	.....	.....	.....	17.57	17.34	14.50	15.87
Mill run	22.96	22.12	20.17	20.06	23.03	20.94	20.34	21.08

TABLE 10.—*Average wholesale prices per 1,000 board feet of different grades and thicknesses of basswood lumber at representative markets for different years and quarter years.*

Market and grade.	1912	1913	1914	1915	1916	1917	1918				1919				1920				1921			
							First quarter.	Second quarter.	Third quarter.	Fourth quarter.	First quarter.	Second quarter.	Third quarter.	Fourth quarter.	First quarter.	Second quarter.	Third quarter.	Fourth quarter.	First quarter.	Second quarter.	Third quarter.	Fourth quarter.
New York:																						
Firsts and seconds 4/4	$41.88	$43.00	$42.00	$41.33	$44.75	$53.08	$59.67	$62.33	$66.00	$66.00	$66.00	$68.67	$76.83	$91.67	$132.33	$150.83	$126.50	$132.00	$108.66	$92.00	$88.00	$88.67
No.1 common 4/4	31.75	33.00	32.00	31.33	33.08	42.92	48.67	50.33	54.00	54.00	54.00	55.00	60.17	67.00	106.33	122.83	102.50	107.00	87.00	62.00	56.00	54.00
No.1 common 6/4	34.75	36.00	35.00	34.33	36.08	46.75	52.00	52.33	56.00	56.00	56.00	57.00	62.17	69.00	112.00	127.83	107.50	112.00	92.00	67.00	61.00	59.00
No.1 common 8/4	36.75	38.00	37.00	36.33	38.08	49.25	57.00	57.33	61.00	61.00	61.00	62.00	67.17	74.00	117.00	132.83	112.50	117.00	97.00	72.00	66.00	64.00
No.2 common 4/4	22.71	25.00	24.83	24.33	25.75	33.08	36.67	40.33	42.00	42.00	42.00	42.33	45.83	50.00	69.67	83.50	68.50	68.67	47.00	40.33	36.00	34.00
Buffalo:																						
Firsts and seconds 4/4	38.13	39.25	38.25	38.25	40.75	51.17	58.17	60.83	65.00	65.00	65.00	67.67	75.50	90.17	130.50	149.17	125.50	130.00	106.67	90.00	86.00	86.67
No.1 common 4/4	28.00	29.25	28.25	28.25	29.08	41.00	47.17	48.83	53.00	53.00	53.00	54.00	58.83	65.50	104.50	120.83	100.50	105.00	85.00	60.00	54.00	52.00
No.1 common 6/4	31.00	32.25	31.25	31.25	32.08	44.84	50.50	50.83	55.00	55.00	55.00	56.00	60.83	67.50	110.17	125.83	105.50	110.00	90.00	65.00	59.00	57.00
No.1 common 8/4	33.00	34.25	33.25	33.25	34.08	47.34	55.50	55.83	60.00	60.00	60.00	61.00	65.83	78.50	118.17	130.83	110.50	115.00	95.00	70.00	64.00	62.00
No.2 common 4/4	18.96	22.00	22.08	22.08	22.75	31.00	33.17	36.50	38.00	39.00	41.00	41.33	44.67	49.17	68.17	81.50	66.50	66.67	45.00	38.33	34.00	32.00
Cleveland:																						
Firsts and seconds 4/4	38.13	39.25	38.25	38.25	40.75	50.75	57.67	60.33	64.50	64.50	64.50	67.17	75.00	85.67	128.25	148.17	124.50	129.00	105.67	89.00	85.00	85.67
No.1 common 4/4	28.00	29.25	28.25	28.25	29.08	40.58	46.67	48.33	52.50	52.50	52.50	53.50	58.33	69.00	104.25	119.83	99.50	104.00	84.00	59.00	53.00	51.00
No.1 common 6/4	31.00	32.25	31.25	31.25	32.08	44.42	50.00	50.33	54.50	54.50	54.50	55.50	60.33	71.00	107.75	124.83	104.50	109.00	89.00	64.00	58.00	56.00
No.1 common 8/4	33.00	34.25	33.25	33.25	34.08	46.92	55.00	55.33	59.50	59.50	59.50	60.50	65.33	75.00	112.25	129.83	109.50	114.00	94.00	69.00	63.00	61.00
No.2 common 4/4	18.96	21.25	21.08	21.08	21.75	30.83	34.67	38.33	40.50	40.50	40.50	40.83	44.17	48.50	67.50	80.50	65.50	65.67	44.00	37.33	33.00	31.00
Detroit and Grand Rapids:																			Grand Rapids only.			
Firsts and seconds 4/4	31.13	38.25	37.25	36.58	39.75	48.08	54.67	57.33	60.50	60.50	60.50	63.17	71.00	85.67	[1]127.67	[1]147.17	[1]123.50	[1]127.00	103.67	97.00	98.00	98.67
No.1 common 4/4	27.00	28.25	27.25	26.58	28.08	37.92	43.67	45.33	48.50	48.50	48.50	49.50	54.33	61.00	[1]101.67	[1]118.83	[1] 98.50	[1]102.00	82.00	57.00	51.00	49.00
No.1 common 6/4	30.00	31.25	30.25	29.58	31.08	41.75	47.00	47.33	50.50	50.67	51.00	52.00	56.50	63.00	[1]107.33	[1]123.83	[1]103.50	[1]107.00	87.00	62.00	56.00	54.00
No.1 common 8/4	32.00	33.25	32.25	31.58	33.08	44.25	52.00	52.33	55.50	55.67	56.00	57.00	61.50	68.00	[1]112.33	[1]128.83	[1]108.50	[1]112.00	92.00	67.00	61.00	59.00
No.2 common 4/4	17.96	20.25	20.08	19.58	20.75	28.08	31.67	35.33	36.50	36.50	36.50	36.83	40.17	44.50	[1] 65.17	[1] 69.50	[1] 54.50	[1] 63.67	42.00	35.33	31.00	29.00

Chicago:																					
First sand seconds 4/4	37.13	38.25	37.25	36.58	39.75	48.08	54.67	57.33	60.50	60.50	60.50	63.17	71.00	85.67	126.33	145.17	121.50	124.00	100.67	84.00	80.00	80.67
No.1 common 4/4	27.00	28.25	27.25	26.58	28.08	37.92	43.67	45.33	48.50	48.50	48.50	49.50	54.33	61.00	101.00	117.83	97.50	99.00	79.00	54.00	48.00	46.00
No.1 common 6/4	30.00	31.25	30.25	29.58	31.08	41.75	47.00	47.33	50.50	50.67	51.00	52.00	56.50	63.00	106.00	121.83	101.50	104.00	84.00	59.00	53.00	51.00
No.1 common 8/4	32.00	33.25	32.25	31.58	33.08	44.25	52.00	52.33	55.50	55.67	56.00	57.00	61.50	68.00	111.00	126.83	106.50	109.00	89.00	64.00	58.00	56.00
No.2 common 4/4	19.96	20.25	20.08	19.58	20.75	28.08	31.67	35.33	36.50	36.50	36.50	36.83	40.17	44.50	68.83	77.50	62.50	60.67	39.00	32.33	28.00	26.00
Minneapolis and St. Paul:																						
Firsts and seconds 4/4	37.13	38.25	37.25	37.17	40.75	48.08	54.67	57.33	60.50	60.50	60.50	63.17	71.00	85.67	126.33	145.17	121.50	124.00	100.67	84.00	80.00	80.67
No.1 common 4/4	27.00	28.25	27.25	27.17	29.08	37.92	43.67	45.33	48.50	48.50	48.50	49.50	54.33	61.00	100.33	116.83	96.50	99.00	79.00	54.00	48.00	46.00
No.1 common 6/4	30.00	31.25	30.25	30.17	32.08	41.75	47.00	47.33	50.50	50.50	50.50	51.50	56.33	63.00	106.33	122.33	102.00	104.00	84.00	59.00	53.00	51.00
No.1 common 8/4	32.00	33.25	32.25	32.17	34.08	44.25	52.00	52.33	55.50	55.50	55.50	56.50	61.33	68.00	111.33	127.33	107.00	109.00	89.00	64.00	58.00	56.00
No.2 common 4/4	17.96	19.67	20.08	20.17	21.75	28.08	31.67	35.33	37.83	37.83	36.50	36.83	40.17	44.50	68.83	77.50	62.50	60.67	39.00	32.33	28.00	26.00
Wausau, Wis.:																						
Firsts and seconds 4/4	34.63	35.63	34.75	34.08	37.25	45.58	54.67	54.83	57.50	57.50	57.50	60.17	68.00	82.67	123.00	141.67	118.00	120.00	96.67	80.00	76.00	76.67
No.1 common 4/4	24.50	25.63	24.75	24.08	25.58	35.42	43.67	42.83	45.50	45.50	45.50	46.50	51.33	58.00	97.00	113.33	93.00	95.00	75.00	50.00	44.00	42.00
No.1 common 6/4	27.50	28.63	27.75	27.08	28.58	39.25	47.00	44.83	47.50	47.50	47.50	48.50	53.33	60.00	102.67	118.33	98.00	100.00	80.00	55.00	49.00	47.00
No.1 common 8/4	29.50	30.63	29.75	29.08	30.58	41.75	52.00	49.83	52.50	52.50	52.50	53.50	58.33	65.00	107.67	123.33	103.00	105.00	85.00	60.00	56.00	55.00
No.2 common 4/4	15.46	17.75	17.58	17.67	19.08	25.58	31.67	32.83	33.50	33.50	33.50	33.83	37.17	41.50	60.50	74.00	59.00	56.67	35.00	28.33	24.00	22.00
St. Louis:																						
Firsts and seconds 4/4	39.13	40.25	39.25	38.58	41.75	50.42	57.17	59.83	64.00	64.00	64.00	66.67	74.17	84.67	127.67	147.67	124.00	128.00	104.67	88.00	84.00	84.67
No.1 common 4/4	29.00	30.25	29.25	28.58	30.08	40.25	46.17	47.83	52.00	52.00	52.00	53.00	57.50	68.00	104.33	119.33	99.00	103.00	83.00	58.00	52.00	50.00
No.1 common 6/4	32.00	33.25	32.25	31.58	34.08	44.25	49.50	49.83	54.00	54.00	54.00	55.00	59.50	70.00	110.00	124.33	104.00	108.00	88.00	63.00	57.00	55.00
No.1 common 8/4	34.00	35.25	34.25	33.58	35.08	46.58	54.50	54.83	59.00	59.00	59.00	60.00	64.50	71.00	113.67	129.33	109.00	113.00	93.00	68.00	62.00	60.00
No.2 common 4/4	19.96	22.25	22.08	21.58	22.75	30.42	34.17	37.83	40.00	40.00	40.00	40.33	43.33	47.50	66.50	80.00	65.00	64.67	43.00	36.33	32.00	30.00

[1] Grand Rapids only.

TABLE 11.—*Average wholesale prices of basswood and yellow poplar for different years and quarter-years, 4/4 inch, No. 1 common grade at Chicago.*

Year.	Basswood.	Yellow poplar.	Year.	Basswood.	Yellow poplar.
1912	$27.00	$34.88	1919:		
1913	28.25	34.71	First quarter	$48.50	$55.17
1914	27.25	32.67	Second quarter	49.50	56.50
1915	26.58	31.25	Third quarter	54.33	63.50
1916	28.08	33.25	Fourth quarter	61.00	72.67
1917:			1920:		
First quarter	33.17	34.50	First quarter	101.00	106.67
Second quarter	40.17	38.17	Second quarter	117.83	123.00
Third quarter	35.67	39.50	Third quarter	97.50	107.50
Fourth quarter	42.67	41.00	Fourth quarter	99.00	86.67
1918:			1921:		
First quarter	43.67	42.67	First quarter	79.00	75.00
Second quarter	45.33	45.50	Second quarter	54.00	55.67
Third quarter	48.50	49.33	Third quarter	48.00	49.33
Fourth quarter	48.50	56.50	Fourth quarter	46.00	54.67

TABLE 12.—*Production of basswood veneer.*

Year.	Wood used, log scale.	Veneer produced.			Cost per 1,000 feet.
		Rotary.	Sawed or sliced.	Total.	
	M feet.	*M sq. ft.*	*M sq. ft.*	*M sq. ft.*	
1905	11,376	.....	.....	82,925	.....
1906	15,659	72,158	1,285	73,443	$15.84
1907	13,561	75,203	2,790	77,993	18.00
1908	11,609	.....	.....	.....	20.16
1909	13,715	.....	.....	.....	20.20
1910	11,003	.....	.....	.....	.....
1911	11,602	.....	.....	.....	.....
1919	11,134	.....	.....	.....	.....

TABLE 13.—*Consumption of basswood for veneer, by States and years, in thousand board feet.*

State.	1906	1907	1908	1909
Wisconsin	8,979	7,480	4,929	5,783
Michigan	2,699	2,282	1,686	3,660
Maine	1,505	1,377	2,204	1,199
New York	1,132	620	864	1,139
Indiana	150	365	785	482
Ohio	146	720	300	428
Vermont	25	131	330	175
Pennsylvania	136	239	246	163
West Virginia	100	64	29	90
Kentucky	24	40	80	50
North Carolina	.....	.....	30	25
Missouri	200	10	.....	10
Tennessee	100	100	12	8
New Jersey	152	8	.....	3
Mississippi	.....	.....	50	.....
Georgia	.....	.....	15	.....
Maryland	.....	.....	10	.....
Virginia	50	75	.....	.....
Alabama	.....	50	.....	.....
Arkansas	260	.....	.....	.....
Illinois	1	.....	.....	.....
Total	15,659	13,561	11,609	13,715

In Table 9 are given average wholesale prices of different grades of basswood lumber per 1,000 board feet f. o. b. mill in Wisconsin and Michigan for the years 1909 to 1916, as reported by sawmills in those States.

Table 10 gives prices of 4/4 firsts and seconds, of 4/4, 6/4, and 8/4 No. 1 common and of 4/4 No. 2 common from 1912 to 1920, in different markets, as published by the Lumberman's Bureau. For comparsion Table 11 gives prices, from the same source, of 4/4 No. 1 common basswood and yellow poplar at Chicago.

VENEER.

Statistics on production.—Table 12 gives available statistics of the Census on the production of basswood veneer for different years. The quantities of veneer produced and the costs are included, where reported. The consumption of basswood for veneer, by States, is given in Table 13 for the years 1906 to 1909, inclusive, which are the only years for which these data are available. Wisconsin and Michigan were the main States producing basswood veneer in 1909; and they are also the main producing States at the present time, because the main timber supply is located in this region.

Manufacture.—Basswood is converted into veneer almost entirely by the rotary process. Logs for veneering should be at least 10 inches in diameter at the small end and reasonably clear, straight, and round (Pl. VI). Hollow logs can be used, however, if the hollow is not too large and there is a thick rim of sound wood. A solid wood plug is driven into the ends of such logs, so that they can be turned in the veneer lathe. The logs are commonly cut into sections about 4 feet long and the usual thicknesses of veneer are from one-fourth to one-sixteenth of an inch. The cost of basswood veneer logs during the summer of 1920 was about $70 or $75 per 1,000 board feet, log scale, in the Lake States, the price depending largely on the quality and location of the timber. Some veneer plants buy woods-run logs and saw the lower grade, unsuitable for veneer manufacture, into lumber, which they are frequently able to utilize at the plant. Woods-run logs cost about $50 a thousand board feet in the summer of 1920.

Basswood is well liked for the manufacture of veneer because it cuts easily. Basswood logs can be sliced into veneer without boiling. In the spring and early summer the logs peel readily, so that no steaming is required. The veneer cores are usually sawed into lumber which some firms convert into cores for cabinet panels or which may be made into small articles such as bottoms and covers of small baskets and boxes.

Uses.—Basswood veneer is used as plywood where several plies are glued together; it makes a very high-grade, light-weight panel. It is

also used for drawer bottoms and mirror backing, because it is not inclined to warp excessively when used in this way. Thick veneer is used for core stock on which cabinet veneers are glued. Basswood veneer is used for the separators of storage batteries and for small cheese boxes.

TABLE 14.—*Consumption of basswood for excelsior, by States, 1911.*

State.	Cords.	State.	Cords.
Wisconsin	15,770	Michigan	1,590
Ohio	3,960	Virginia	60
Iowa	3,784	New Hampshire	25
New York	2,772	All other States	3,410
Pennsylvania	1,671		
		Total	33,042

EXCELSIOR.

Statistics on production.—Statistics of the Bureau of the Census on the production of excelsior are available only for the year 1911. Table 14 gives these statistics by States. The 33,000 cords of basswood consumed in that year in excelsior manufacture is equivalent to about 16,000,000 board feet of lumber. This was nearly one-fourth of the entire amount of wood reported for excelsior manufacture. Cottonwood and aspen grouped together and yellow pine were used in larger quantities, according to these statistics. When the different species are separated, however, aspen ranks first, basswood second, black cottonwood third, and the common cottonwood fourth.

Wisconsin is the main State in the manufacture of basswood excelsior; for 1911 nearly one-half of the entire amount used for this purpose in the United States was reported for that State. Mills making basswood excelsior are now located principally in northern Wisconsin.

Manufacture.—Excelsior is commonly termed "ribbon veneer," because it is composed of thin strands shaved from the surface of the wood. Requirements for excelsior are that it be elastic or resilient and light in weight and color. It is also preferred free from odor, although for some purposes, such as furniture packing, a slight odor is not objectionable. The quality most demanded is resiliency or "life"—that capacity of being compressed into a small volume and of expanding after being so compressed. Wood for the manufacture of excelsior should be light in weight, not brittle, soft, straight-grained and preferably free from odor. A light-colored wood is also desirable. Basswood meets the requirements of an excelsior wood better than any other timber and produces the best grades.

The scarcity and high price of the wood prevent its use in larger quantities. Excelsior manufacturers in regions where basswood

timber grows find it increasingly difficult to get supplies. Even in southern Wisconsin and Michigan there is little now obtainable, and firms in northern Wisconsin, which is probably the region in which the best supplies are located, find it necessary to use mainly other woods.

Wood for the making of excelsior is used in the form of the bolt, from which the excelsior is shaved by a special machine. The surface of the bolt is first scored by means of a series of steel teeth set the same distance apart as the width of the excelsior strand. The slicing knife then shaves off the excelsior in the finished form. Basswood bolts for making excelsior generally go into the machine 18 inches long, and the bolts are therefore purchased in lengths which are multiples of 18 inches with about an inch allowance for trimming the ends.

Basswood bolts are purchased either with the bark, or peeled, a somewhat higher price being paid for the peeled. In unpeeled bolts the wood is marketed in the green condition. The bark must be removed while the timber is green in order to peel thoroughly. Peeled basswood should be well seasoned before it goes into the machine. Manufacturers prefer not to buy excelsior wood which has air-seasoned for more than two years, however, because it may become brittle. Kiln-dried wood is apt to be brittle if it has been subjected to too high temperatures, and for this reason the air-seasoned wood is preferred.

Specifications for basswood for excelsior generally call for 37 and 55 inch lengths, either green and unpeeled or dry and peeled, the sticks to be sound, reasonably straight, and free from large knots. Sticks must be not less than 4 inches in diameter at the small end. Sizes up to 6 inches in diameter are left round; sizes from 7 to 12 inches are split in halves; pieces over 12 inches are split into four or more pieces.

The average yield of excelsior from a cord of basswood is about 1,600 or 1,700 pounds, depending on the dimensions of the bolts and the coarseness of the strands. This is below the average for all woods, which is about 2,000 pounds.

Waste.—The weight of a cord of air-dry basswood free of bark compared with the weight of its yield in excelsior shows a waste of approximately 30 per cent in manufacture. This waste results chiefly from squaring the bolts, trimming off knots and other defects, and from the loss of the small slab or "spalt" by which the dogs hold the bolt during the operation of slitting and slicing the excelsior. Even this small piece is often utilized by cutting it into paper-roll plugs, which go into the ends of rolls of wrapping and roofing papers.

Uses.—Excelsior is used largely for packing glass, earthenware, and other commodities for shipment. It is also used for mattresses,

the upholstery of furniture and vehicles, kennel and stable bedding, for decorative purposes in shop windows, stuffing dolls and toy animals, as a substitute for absorbent lint used in surgery, for filtration purposes, and to a limited extent for woven floor coverings. Basswood excelsior sells for the highest prices and serves mainly for the higher class of uses, such as the better grades of excelsior upholstery. Basswood makes a very good grade of wood wool, which is the name applied to excelsior composed of very fine strands, and in this form it is useful as absorbent lint and for packing fragile articles.

TABLE 15.—*Consumption of basswood for paper pulp for different years.*

Data.	1916	1917	1918	1919	1920
Average cost per cord f. o. b. mill	$9.57	$8.95	$13.81	$16.13	$18.39
	Cords.	*Cords.*	*Cords.*	*Cords.*	*Cords.*
Maine			1,017	734	1,594
New York	976	3,698	8,922	4,629	4,666
Pennsylvania	10,405	109	171		
All other States	100		2,000	4,436	4,209
Reduced by:					
Soda process	11,481	3,807	12,089	9,201	10,469
Mechanical process			21	479	
Sulphite process				119	
Total used	11,481	3,807	12,110	9,799	10,469

PULPWOOD.

Statistics on the use of basswood for paper pulp are available for the years 1916 to 1920, inclusive, and are given in Table 15. These figures show a wide fluctuation in the use of basswood, both by States and for different years. The amount of basswood converted into paper pulp is very small in comparison with both the total amount of wood used for pulpwood and the total annual consumption of basswood for all purposes.

Basswood is peeled free of bark before being sent to the pulp mill. It is converted into pulp almost entirely by the soda process and produces a high-grade product, principally book, magazine, and writing paper. It is well adapted for pulp manufacture, because of the softness and light color of the wood and its freedom from resin, which enable it to be bleached readily into high-grade stock.

SLACK COOPERAGE.

Basswood is well adapted for the heading of slack barrels, because it holds its shape well and is easily worked. Its light weight and light color also make it desirable for this purpose. Basswood is not suitable for barrels designed to hold heavy contents, such as castings and cement; it is used mainly for containers of food products. It is

preferred above all other woods for flour-barrel headings, because of its clean appearance. It makes a fairly tight barrel, because of its freedom from warping. Basswood is superior to yellow poplar for this purpose, because the latter wood is more liable to split. The best, or No. 1, heading for such barrels is usually of basswood. It is often used with cottonwood staves, and these two woods make a very clean and attractive-looking barrel.

Table 16 gives quantities and value of basswood heading produced in the years 1906 to 1911, inclusive, and in 1919, as reported by the Bureau of the Census, and in 1918 as reported by the Forest Service. There has been a large reduction in the amount of basswood used for heading in recent years, which can be ascribed to the scarcity and high price of the stumpage of this timber. Wisconsin, Michigan, and Minnesota have reported the largest quantities. Nearly all of that reported in 1919 was manufactured in Wisconsin and Minnesota. The production of basswood staves and hoops is also given in Table 16 for years in which it was reported for these purposes. Its use for staves and hoops in former years was due to its plentifulness rather than to its particular adaptability for these products, and in the industry it is now confined to heading alone. Cooperage manufacturers in the Lake States generally purchase the timber in the form of stumpage and in mixture with other species, such as beech, birch, and maple. Such timber in Minnesota has recently been purchased by cooperage firms for $8 or $9 per acre.

TABLE 16.—*Production of basswood slack-cooperage stock and value for different years.*

Year.	Heading.			Staves.			Hoops.	
	Number (thousand sets).	Value per 1,000 sets.	Rank.	Number (thousands).	Value per 1,000.	Rank.	Number (thousands).	Average value per 1,000.
1906	15,653	$47.11	4	8,307	$5.31	12	.....	.....
1907	9,585	59.65	5	18,640	7.00	12	.....	.....
1908	10,186	60.04	5	6,306	5.63	15	.....	.....
1909	13,910	55.84	4	72,537	5.48	8	30	$7.00
1910	[1] 8,000	[2]	.....	.....	.....	.....	.....	.....
1911	10,014	[2]	.....	.....	.....	.....	.....	.....
1918	2,251	[2]	6	.....	.....	.....	.....	.....
1919	3,078	[2]	6	.....	.....	.....	.....	.....

[1] Approximate.
[2] Data not obtained.

TABLE 17.—*Annual consumption of basswood in the United States by secondary industries for different classes of uses.*

Industry.	Quantity used annually.	Industry.	Quantity used annually.
	Feet b. m.		*Feet b. m.*
Boxes and crates	86,979,611	Clocks	1,415,000
Planing-mill products, sash, doors, blinds, and general millwork	60,557,122	Machine construction	1,155,403
Woodenware, novelties, and dairymen's, poulterers', and apiarists' supplies	58,563,923	Ship and boat building	959,000
Furniture	33,146,276	Brushes	758,300
Trunks and valises	21,164,406	Shade and map rollers	702,500
Picture frames and molding	20,340,700	Pulleys and conveyors	625,000
Musical instruments	10,968,180	Printing material	352,600
Toys	8,739,242	Sporting and athletic goods	318,600
Agricultural implements	7,861,750	Sewing machines	310,000
Fixtures	7,114,755	Electrical machinery and apparatus	299,000
Vehicles and vehicle parts	6,418,308	Plumbers' woodwork	245,000
Matches	5,575,000	Dowels	167,500
Refrigerators and kitchen cabinets	5,221,634	Patterns and flasks	123,500
Car construction	5,148,521	Signs and supplies	100,000
Laundry appliances	4,980,670	Saddles and harness	52,000
Tobacco boxes	4,281,250	Gates and fencing	50,000
Boot and shoe findings	3,599,200	Weighing apparatus	35,000
Caskets and coffins	2,728,038	Dry kilns	35,000
Professional and scientific instruments	2,619,070	Whips, canes, and umbrella sticks	32,500
Handles	2,285,885	Elevators	10,000
Shuttles, spools, and bobbins	1,947,000	Tanks and silos	5,000
Chairs and chair stock	1,758,338	Artificial limbs	1,000
		Total	369,750,782

SECONDARY INDUSTRIES.

Statistics have been collected by the Forest Service covering the use of lumber by factories in the manufacture of various wooden products during the years 1909 to 1913. Figures on the annual consumption of basswood during this period are shown in Table 17 by classes of industries and in Table 18 by States. The quantities of basswood used for these different purposes are generally less at the present time than these statistics give. It is believed, however, that the figures show in a comparative way the importance of the different industries in the use of basswood, except as noted in the text. A detailed list of the reported uses of basswood by the industries is given in the Appendix.

TABLE 18.—*Annual consumption of basswood in the United States by secondary industries, by States.*

State.	Quantity used annually.	State.	Quantity used annually.
	Feet b. m.		*Feet b. m.*
Wisconsin	86, 100, 203	Connecticut	3, 559, 598
New York	56, 977, 220	Iowa	3, 237, 040
Michigan	56, 432, 782	New Hampshire	3, 096, 826
Illinois	50, 905, 500	Virginia	1, 591, 900
Minnesota	24, 278, 769	Missouri	1, 527, 587
Ohio	22, 833, 367	Rhode Island	909, 000
Pennsylvania	18, 698, 836	Delaware	707, 839
Indiana	12, 927, 003	District of Columbia	359, 050
Kentucky	6, 642, 000	North Carolina	265, 000
Tennessee	6, 028, 833	South Carolina	165, 000
Maine	4, 773, 100	Louisiana	160, 000
Massachusetts	4, 399, 000	Washington	107, 000
Vermont	4, 247, 630	Nebraska	103, 489
Maryland	4, 202, 050	All other States	317, 895
New Jersey	4, 056, 315		
West Virginia	3, 968, 450	Total	383, 578, 282

BOXES AND CRATES.

Woods suitable for the construction of boxes and crates are divided, on the basis of their physical and mechanical properties, into four groups. Basswood falls into the first group, including the lighter woods, which vary in average weights when thoroughly air-dry from 21 to 35 pounds per cubic foot, are soft and easily worked, hold nails moderately well, and do not readily split in nailing. Both softwoods (conifers) and hardwoods (broadleaf trees) are represented in this group.

Basswood is very desirable for certain kinds of boxes on account of its light weight, white color, and freedom from odor. Its good working qualities, freedom from excessive warping and splitting, as compared with other light-weight woods, and good nailing qualities also help to make it valuable box material. For boxes in which heavy merchandise must be shipped or which must stand much rough handling, such as boxes for export shipment, stronger and therefore heavier woods are demanded.

For boxes made to hold foodstuffs, such as crackers, chocolate, and candy, basswood is the ideal wood. In such boxes the contents are often in direct contact with the wood, and no odor or taste is imparted by basswood. Basswood is also used for shipping other kinds of provisions, such as dressed poultry and butter, because of its odorless quality. Boxes for this purpose are sometimes made from cheaper resinous woods and paraffined on the inside, but this process is expensive. Yellow poplar is used for such boxes, also cottonwood and tupelo. although the last two woods are much inclined to warp.

It is a common practice for manufacturers to make the shipping box serve as an advertisement for their products. Basswood makes an attractive box, and stenciling or printing shows to good advantage on the wood. White pine is the old reliable box wood, but it splits more readily than basswood. Boxes for holding bottles, particularly those containing soft drinks, are often made of basswood, because holes can be bored in the wood very close together in the same piece without splitting, and it holds its shape well even when alternately wet and dry.

Basswood has the disadvantage however, of discoloring, and of molding and decaying readily in damp situations, and this makes it unsatisfactory for many kinds of boxes. If left in contact with the ground, especially if the ground is wet, basswood will soon decay. For shipments which are likely to be subjected to considerable moisture, therefore, including bottled and canned goods, basswood is not altogether suitable.

Basswood is not used in as large quantities for boxes as several other woods, because of its comparative scarcity and high price. Of white pine and yellow pine, the main box woods, about one billion board feet each are used annually for boxes and crates, and the annual consumption of basswood for the same use is probably between 50 million and 100 million board feet. Yellow poplar, cottonwood, and several other woods are used in larger quantities for boxes than basswood, because the supply of the latter wood is much less and the price generally higher. It is not usually made into large packing boxes, but its use is largely confined to small, special boxes where the desirable qualities of the wood can be made to serve to best advantage. In basswood, the lower grades, which in other species make up the bulk of the box material, are unfortunately not suited to the manufacture of some of the main kinds of boxes for which it is valued, because of defects, such as dark and decayed streaks, which are usually present in the low-grade stock. Box makers, therefore, generally prefer to use other woods, such as yellow poplar, cottonwood, aspen, sap gum, and tupelo.

Box factories prefer the No. 1 common lumber grade. On account of the high price, however, they generally use No. 2, and even No. 3 common. Usual thicknesses of basswood lumber for boxes are three-eighths, one-half, and thirteen-sixteenths of an inch. Narrow widths can often be utilized. Up to a few years ago, factories in Ohio, Indiana, and Illinois obtained the greater part of their basswood from Wisconsin and Michigan. These factories now depend for the most part on West Virginia for this timber. On account of the more limited supplies of this wood and greatly increased freight costs, the use of basswood in this section is being greatly curtailed. Even box factories of Michigan and Wisconsin now find it difficult

to get sufficient quantities. Recently box manufacturers in the Lake States have been using aspen, commonly called "popple," in place of basswood. The aspen must be used in narrow widths.

Box makers use the grading rules of the various lumber associations in the purchase of lumber. For box shooks, however, grading rules have been drawn up for different woods by the National Association of Box Manufacturers. There are four grades for basswood shooks—clear, No. 1, No. 2, and No. 3, as follows:

Clear grade.—Lumber in the clear grade of boxes must be practically free from knots, and must be of good color, running largely to white basswood. This grade may contain, however, 15 to 20 per cent of red color, but must not contain black or brown.

Grade No. 1.—Lumber in grade No. 1 of boxes must be good, sound material of mixed colors, light and brown, and should contain at least 50 per cent of reasonably light-colored basswood. Small, sound knots are allowed in this grade, and some stain.

Grade No. 2.—Lumber in grade No. 2 of boxes must be reasonably strong but shall not be graded as to color. Brown basswood can prevail in this grade; small knots and shake can prevail, but not in sufficient quantities to materially weaken pieces. Some stain is allowed in this grade.

Grade No. 3.—Lumber in grade No. 3 of boxes is not graded as to color. Black knots and stain are allowed in this grade.

Michigan, Wisconsin, Illinois, New York, and Minnesota use basswood in largest amounts for box manufacture.

Baskets, mainly those for holding grapes and berries, are often made of basswood. The splints are sometimes of this wood because of its good working qualities and good appearance; more often, however, the sides are of some tougher wood, as birch or maple. The covers and bottoms of such baskets are quite commonly of basswood, because it is light in weight and nails easily. These parts, since they are small, can often be made from waste in the manufacture of other basswood articles. Low-grade basswood is often used for crates. It is well suited for light crating, and narrow-width material can be used very advantageously for this purpose.

PLANING MILL PRODUCTS, SASH, DOORS, BLINDS, AND GENERAL MILLWORK.

Basswood has been a favorite wood for many years for planing mill products, sash, doors, blinds, and general millwork, particularly for inside finish, becasue it machines to a smooth surface when seasoned, keeps its shape well, and takes finishes extremely well. It is one of the best woods for enamel work because of its uniform, clear, light color, smooth finish, and even texture, which absorbs and holds the paint evenly and well. It also finishes well with other paints and varnish. There is a greater demand for figured wood for these products, such as that of red gum, birch, and oak. Much

basswood is used, however, for interior woodwork, especially for ceiling and in the form of wide boards for finishing and panel work. On account of its adaptability to cutting with tools, basswood serves well for moldings and carved work in interior finish of various kinds. Much basswood is also manufactured into bevel siding, but it is not so well adapted to exterior work because of its liability to decay.

Michigan and New York lead in the manufacture of this class of products from basswood. Formerly much basswood was used for this purpose in Ohio, but increasing scarcity and cost of shipment have greatly reduced the quantities going into the industry. Rising costs of the upper clear grades have had much to do with discouraging its use, for the dark-colored and streaked material of the lower grades is much less valuable for these purposes. Yellow poplar, birch, and the softer grades of pine are now generally used in place of basswood.

WOODENWARE AND NOVELTIES.

Basswood is made into articles of woodenware used in the shipment of provisions, such as pails and tubs. It is well liked for such uses, because it is light in weight and odorless, and the light color of the wood makes a good appearance. On account of its good working qualities, it is easy to manufacture into such products. It also has the advantage of showing stenciling extremely well. The light weight of the wood effects a large saving in freight, both when shipped empty to the purchaser and when filled with provisions.

Basswood is the favorite wood for candy pails, because it gives an appearance of cleanliness. For the same reason it is used for jelly pails, called "jelly kits," which are used for the shipment of jelly in bulk. Most liquids will seep through basswood, but jelly hardens in the wood and prevents the liquid from coming through. Fish pails and pickle pails are sometimes made of basswood, in which case they must be paraffined to make them water-tight. Such pails are made more commonly of a hard pine. Lard pails, lard tubs, and grease pails are commonly made of basswood. They are usually varnished on the outside and given a finish to resemble the grain of oak or some other hardwood. Candy pails are sometimes grained in this way also. Fish, pickle, and jelly pails are usually painted or decorated in some characteristic manner.

Generally only the sides and covers of these pails are of basswood. The bottoms are usually made of Norway pine, maple, or birch. A fairly hard wood is necessary for the bottoms in order to bear the weight of the contents of the pail and to make a tight, rigid joint. The staves for the sides of these pails are cut from basswood bolts by a tight-stave circular saw. After being thoroughly dried they are trimmed to the proper length and width and a small tongue and groove made along the edge on the two sides (fig. 5). They are

WOODS-RUN BASSWOOD LOGS PURCHASED BY A WOODENWARE FACTORY FOR MANUFACTURE INTO CANDY PAILS.

TOP OF 17-INCH DIAMETER BASSWOOD LOG WITH A 4-INCH RIM OF SOUND WOOD. HOLLOW LOGS WITH A SHELL OF SOUND WOOD AS NARROW AS 4 INCHES ARE ACCEPTED BY SOME FACTORIES.

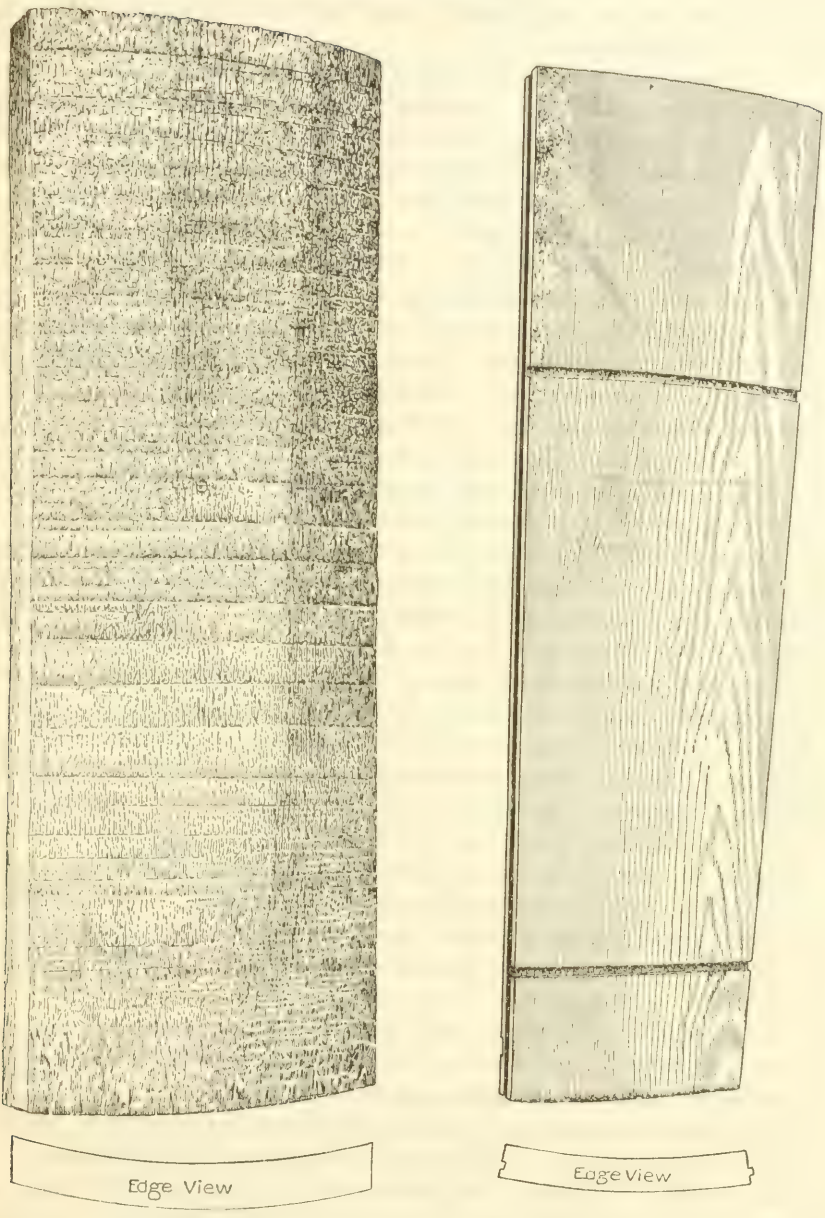


FIG. 5.—Rough and finished candy pail staves.

then assembled to form the partly finished pail, which is grooved inside to receive the bottom and outside for the wire bands. This is next turned smooth and sanded inside and out, the bottom inserted, and the bands put on.

Dark basswood can be used for these pails as well as light. The wood must be quite clear, but small, tight knots are not objectionable. The timber usually comes to the factory in the form of logs. Some firms buy only No. 2 logs, which is the grade below the veneer-log grade, since they can use sizes as small as 6 inches in diameter at the small end. They prefer woods-run logs, however, if these are not too high-priced (Pl. VII). The pail covers are generally made from the waste in manufacturing staves. Hollow logs, which are quite characteristic of basswood, can be utilized to good advantage, because the outer sound rim of wood, if not too narrow, can be cut into stave bolts and staves with comparatively little waste. Such logs can usually be worked much more profitably into staves than into lumber. Some hollow logs otherwise sound will yield one-third more than the log scale in pail staves, when for lumber there would be little if any overrun and only narrow widths could be obtained.

Logs are generally purchased in 8 to 10 foot lengths, but much material is also purchased in lengths of about 3 feet, especially small-diameter timber, which is bought of farmers. Hollow logs are accepted, but they should have at least a 6-inch rim of sound wood. Hollow logs are sometimes taken down to a 4-inch shell, but such material often can not be handled at a profit because of the expense of the labor to work it up (Pl. VIII). Small logs are profitable because there is a large overrun in such logs compared with the yield in lumber. Although factories prefer the timber not smaller than 6 inches in diameter, 5-inch and even some 4-inch sizes are taken if of good quality. Some manufacturers prefer to purchase by the cord of 128 cubic feet and in 39 and 52-inch lengths. On account of the difficulty of getting it cut up, much small material is now shipped in 12-foot lenths. Second-growth timber is considered the best quality.

Prices paid for basswood are quite variable, depending on the general quality of the timber and the location; they range from about $20 to $30 a thousand board feet f. o. b. cars at loading point. Freight costs often amount to $5 to $10 a thousand in addition to this.

Pail manufacturers of Michigan, Wisconsin, and Minnesota in some instances own extensive timber tracts in the northern parts of these States from which they get a large part of their raw material. Basswood is becoming scarce even in this region, and manufacturers must depend on other species. Aspen is being used to some extent in place of basswood, although the supply is limited, sizes are small, and the wood is much inclined to be defective, doty, and discolored.

The wood of balm of Gilead, a tree which resembles the aspen, is not liked because it is shaky and otherwise defective. The white or paper birch is sometimes used when supplies are available and is said to make a good pail. Second-growth white pine, if not too defective, is also fairly satisfactory.

Factories in Michigan, Wisconsin, and Minnesota have difficulty in getting sufficient suitable timber, and those which are not located conveniently to a supply from the northern parts of these States have in some cases been compelled to go out of business or move farther north. Even this supply is becoming so scarce that large manufacturers realize that they must look to new territory. It is probable that a large part of the industry will be transferred in the near future to the Pacific coast, where, in some instances, tracts of softwood timber have been already acquired for the purpose.

A large demand exists for pails of the kind just described. As a rule, they are not used a second time, on account of the cost of shipment and because they find a ready sale at retail stores.

The cheese box is another common woodenware commodity made of basswood. Small cheese boxes used for shipping fancy cheeses are commonly made of basswood throughout. Veneer is used for the sides, and small pieces of thicker stock for the bottoms and covers. Basswood is also sometimes used for the heading for large cheese boxes; for the sides of these larger boxes a strong tough wood, such as elm, is required. In making the small cheese boxes the better grade of logs is used for the veneer, and low-grade and small logs are sawed into lumber for the bottoms and tops. Such lumber, even though defective, yields a large amount of the small, clear pieces required. Basswood is easy to manufacture into this product and makes a light and attractive box for the purpose.

A very large number of other articles of woodenware are commonly made of basswood. Important among these are kitchen utensils, such as bread boards and boards for cutting slaw and other vegetables; also such articles as bowls and candlesticks, which are turned on the lathe and to which hand carving may be added. Cloth boards on which goods are wound, lap boards, and cutting boards of various kinds are commonly of basswood, because it is white, light in weight, and not so readily split as many other light woods. Small, clear pieces of waste basswood are often worked into such articles as fan handles. Wooden novelties of many kinds, often sold as souvenirs, are made of basswood because of its good working qualities. Checkers and dominoes are commonly of this wood, because it shows painting to excellent advantage. Basswood is the favorite wood for pyrography because of its whiteness, although little is now used in this way. Porch shades, snow shovels, and ladders are other articles in which basswood is valued because of its light weight. Because it

shows printing and writing well, it is made into barbers' checks, and labels attached to hay bales on which the weight is written.

Since plentiful supplies of comparatively cheap timber are necessary in the manufacture of different kinds of woodenware, the factories are located near the principal supplies of the timber they use. Wisconsin consumes by far the largest quantities of basswood for these products, and Michigan and Minnesota also use large amounts. New York and Ohio are likewise important in the consumption of basswood for woodenware articles. Outside of these five States the amount of basswood used for these purposes is very small.

APIARISTS', POULTERERS', AND DAIRYMEN'S SUPPLIES.

Because it gives a white, clean appearance and is odorless, basswood is the preferred wood for the honey section, which holds the honeycomb in the hive, and in which comb honey is retailed to the trade (fig. 6). Purchasers are very discriminating concerning the appearance of the package holding honey. A dark or discolored wood gives the impression that the honey is inferior in quality. Only the white, clear basswood will serve for the best grade of honey sections. A second grade is usually made which is cream-colored. This grade must be uniformly colored, however, and the wood must be free from defects. Although the best grade of basswood lumber is most suitable for the manufacture of these sections, factories find it more economical, on account of the high price of such stock, to purchase a lower grade or a mixed grade and to work up brown and otherwise discolored stock, which is unsuitable for honey sections, into fences and separators which go between the honey sections in the hive (fig. 6). These parts can be satisfactorily made of other woods, such as pine, when sufficient basswood is not available. It is stated that pine is even more suitable, because the basswood is liable to mold. Some firms purchase basswood lumber of the grade No. 1 common white, in which a small percentage of brown wood is admitted, and which costs them about $10 a thousand board feet more than the regular No. 1 common grade. A combination of No. 2 common and better grades, called "log-run," can often be used to good advantage by such factories, since a large percentage of clear, white stock can often be worked out. Narrow-width and short-length lumber can be utilized; and round-edge, i. e., lumber which has not been edged, can be worked up advantageously.

Several machine operations are necessary in making the honey section. First, the plain strip is made by resawing inch boards; the sides are next trimmed out, which allows the bees to enter when the sections are placed face to face; the strips are then notched at each end to make a lock-cornered joint; finally, three V-shaped scorings are made across each piece where it is later bent at right

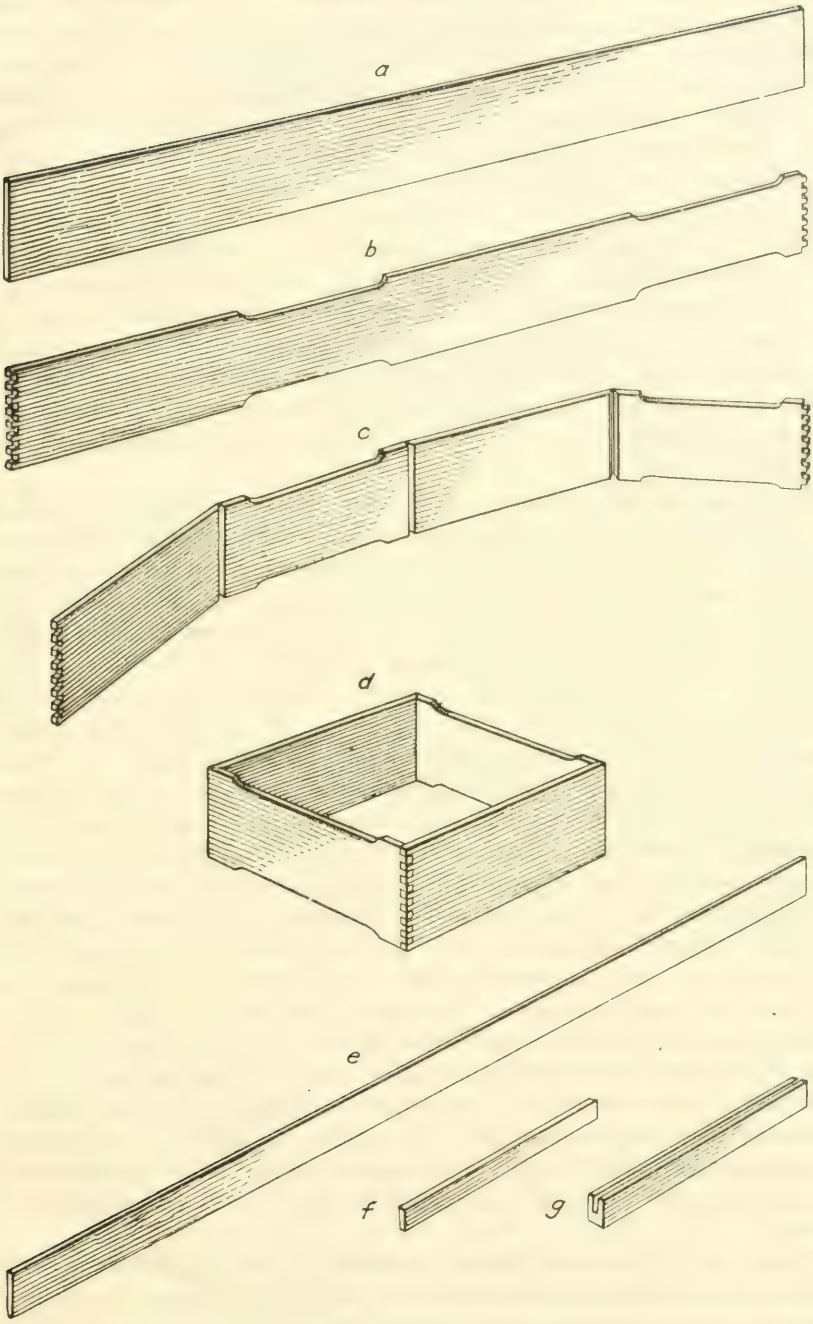


FIG. 6.—Apiarists' supplies made of basswood: *a*, *b*, *c*, and *d*—the different steps in the manufacture of the honey section,; *e*, *f*, and *g*—parts making up the "fences" or separators that go between the honey sections in the hive.

angles to form the completed honey section. The strips are shipped flat from the factory and should be steamed at the scorings to bend satisfactorily. Apparatus is sold to apiarists for this purpose, although the strips can be bent without breaking by moistening the wood where the scorings have been made. Basswood does not break readily when bent in this way, which makes it valuable for this use.

Manufacturers of honey sections prefer to get their basswood from the Lake States. Some is purchased from West Virginia mills, but this is not considered so white and clear or so suitable for this use. Basswood which is cut in the winter is preferred for the manufacture of honey sections, because it is less likely to discolor than if cut in the summer. Some firms make a practice of buying it partially seasoned in the winter. It is then piled in the open on sticks for 9 months to a year, after which it is piled solid for a year under cover. Where this practice is followed it is necessary to keep a very large stock of lumber on hand.

Factories making honey sections and other bee-keepers' supplies generally find it necessary to manufacture a number of miscellaneous articles in order to utilize their small-dimension and defective basswood. Such articles as small boxes, handles of cheap fans, calendar sticks, and washboards are among the most common. Trimmings cut from the ends of thin basswood strips are sold for hay-balers' labels, on which weights are written. Brown and dark-streaked material can be used for these purposes. Basswood is sometimes used for the interior of hives and occasionally for the sides, but white or western yellow pine is more often used for these parts, and cypress for the tops and bottoms, because a more durable wood is desired.

Manufacturers of apiarists' supplies assert that there is no satisfactory substitute for basswood in the manufacture of honey sections. Yellow poplar is not so strong at the corners of the honey sections where it is bent and, moreover, it not in general so white and clear as basswood. The sapwood might serve, however, if it could be obtained in large quantities. Cottonwood might be made to serve, but it does not machine smoothly. The warping of tupelo, which might otherwise be suitable, precludes its use for the purpose.

Other articles for which basswood is adapted are butter molds, because it looks clean and can be easily carved, and parts of churns, on account of its light color. Incubators and poultry coops are often made partly of basswood, because it is light in weight and easy to work.

New York, Wisconsin, Illinois, and Ohio use the largest quantities of basswood for this line of wooden products, because of the bee, dairy, and poultry industries in those States.

FURNITURE.

Basswood is an important furniture wood because it glues well and takes and holds screws and nails very satisfactorily. It is well liked for such parts as drawer sides and bottoms, mirror backing, and shelves, because it does not warp to any great extent. Basswood is often used for the inside and hidden parts of expensive furniture. It is not generally used for outside work in furniture, because it lacks the strength of other woods, such as oak and red gum, and does not have an attractive grain or figure for finishing in the natural state. It is, however, used in enamel work, for which purpose it is well adapted, because it has a uniform texture, takes paint well, and, since it does not shrink and swell to any great extent, it is not inclined to crack the enamel coating as many other woods do.

Basswood serves well for cores of panels finished in expensive veneers. It is especially well suited for producing curved surfaces in furniture, because it can be readily bent into various forms by steaming, holds its shape after it is dry, and glues well. It is in demand, therefore, as a core wood for curved and irregular surfaces which are to be covered with figured veneer. Basswood is valuable also as core stock for large panels, because it can be obtained in large, clear pieces. Experiments on panels show that there is less warping when a low-density core wood, such as basswood, is used than with a high-density core wood. The low-density core wood has the additional advantage of making a light-weight panel. Basswood, also, does not split so readily as many other light-weight woods and holds the veneer well. In the gluing process basswood absorbs the glue very readily; therefore, a liberal amount of glue should be used in order to avoid a starved joint.

The following States use basswood for furniture in largest amounts: Illinois, New York, Michigan, Pennsylvania, Wisconsin, Minnesota, Ohio, and Indiana.

TRUNKS AND VALISES.

Basswood is an ideal wood for trunks because it is light in weight, does not split readily, holds nails well, is easily worked, keeps its shape well, and is available in wide, clear pieces. Some trunk manufacturers use basswood exclusively for the trunk box and also for the lid and trays. The trunk box may be made up of a single thickness of basswood or the sides may be 3 or 5 ply. Trunks made of plywood are more serviceable, because the plywood panels will stand shock better without splitting or breaking than the solid panels. The plywood is made of three or five thicknesses of basswood veneer one-sixteenth to one-twelfth of an inch thick, glued together with the direction of the grain in each sheet at right angles to that in adjacent sheets. Each ply may be made up of several strips of veneer, and small

defects are permitted if they do not interfere with the soundness of the stock. Discolored material can therefore be used. The trunk-box is nailed together and the nails are placed very closely. Even the thin pieces making up the trunk tray are usually fastened together by nailing. The trunk box is covered by an outer and an inner layer of fiber glued to the plywood, which protects the wood and adds to the appearance of the trunk. When the trunk is made of one thickness of wood throughout, boards, generally three-eighths or seven-sixteenths of an inch in thickness, are matched by means of tongue-and-groove along the sides.

Sample cases are often constructed like trunks and made of basswood. White pine is said to make a fairly satisfactorily trunk box, but splits more readily than basswood. It is said that yellow poplar makes too heavy a box, and cottonwood is hard to work and does not hold its shape well. Factories making the solid boxes usually purchase inch lumber and resaw it. They may buy low-grade lumber and cut out the suitable stock, or, they may find it advantageous to purchase log run and utilize the various grades. Makers of plywood trunks generally buy the sheets of plywood already glued up. Veneer plants making plywood for trunks use fairly clear logs 10 inches and up in diameter, which they cut into lengths of about 4 feet. The cores left after cutting the veneer can be profitably used by such factories for making high-grade cabinet panels, since basswood is an excellent core wood for such panels.

Wisconsin and Ohio use the largest quantities of basswood in the manufacture of trunks, followed by New York, Illinois, Michigan, and Pennsylvania.

It is not likely that basswood will be replaced by other woods in trunk manufacture until its extreme scarcity makes this necessary. Large quantities of southern pine, usually the softer grades, are used for low-priced trunks. To some extent, trunk makers are using red-gum plywood, which they are able to make thinner than the basswood because of its greater strength. By making it into plywood the natural warping of red gum is very largely overcome.

PICTURE FRAMES AND MOLDING.

Basswood was formerly the principal wood used for picture frames and molding, because it works well with tools, finishes well, holds its shape, and is well adapted for the highly decorative composition and gilt work which was very much in demand until recently. However, the demand is now very largely for embossed work. In embossing, the tool, which is usually a heavy metal disc, is forced into the wood while hot and leaves an imprint. Basswood exhibits a certain amount of sponginess under this treatment, the wood rising where the imprint is made, so that it is not satisfactory for the purpose. For this

reason much smaller quantities are now used in this industry than formerly. Red gum has been very largely substituted in embossed work. Basswood is still used to a large extent for plain moldings which are to be painted, and also as core material for moldings finished in highly figured veneers. It is said to be the most satisfactory core material available for this use. It is also well liked for carved moldings, because it cuts so well with tools. Illinois and New York were the principal States reporting basswood for these products.

MUSICAL INSTRUMENTS.

Basswood enters very largely into the manufacture of musical instruments, chiefly pianos and organs. It is used mainly for interior small parts, for which its light weight and ability to hold its shape make it suitable. It is also much used for piano and organ cases. For organ bellows, wind chests, and swell boxes it is especially suited, because of its lightness, good working qualities, and freedom from warping. Basswood is the choice wood for piano and organ keys because of its whiteness, light weight, and good staying qualities. Only the highest grade of the wood, however, serves as piano-key stock. This is selected white wood which is seasoned with much care, since a small amount of warping in the key may interfere with its action.

Basswood also goes into the construction of phonograph cabinets, in the form of cores for the panels finished in mahogany, walnut, and oak veneers. Stock of small dimensions can often be utilized in this way.

Basswood is employed for necks of mandolins, for violin cases, and for other such uses. The principal States using basswood for musical instruments are New York, Illinois, Connecticut, Michigan, and Ohio.

The highest average cost reported for basswood by the industry indicates that a high grade of stock was purchased for this class of uses. This average cost was more than double that reported by the box-and-crate and woodenware industries for basswood, and nearly 50 per cent more than that reported for furniture.

TOYS.

Basswood is highly valued by toy makers because of its good working, staying, and finishing qualities, on account of which it is the principal wood used in the United States, both for toys made entirely of wood and for the wooden parts of metal toys. It is not only used in greater quantities, but enters into the manufacture of more kinds of toys than any other species. Among the most common toys are wagons and buggies, in which basswood is used for the bottoms. Other toys in the same class which use much basswood are sleds, automobiles, and wheelbarrows. Hobbyhorses and small toy ani-

mals of various kinds are other products made largely of this wood, as well as toy boats. Toy pianos and doll houses are usually of basswood, which is also the favorite wood for toy cannon and popgun stocks because it is easily bored and turned to shape. It is the wood used in making the wooden doll of recent introduction and valued for its indestructibility. The head, which is also of solid wood, is carved to form the face and enameled in lifelike colors. Basswood is very largely employed in the making of toy blocks of various kinds, because it is so easily worked and takes printing well.

Toy manufacturers generally purchase a combination of No. 2 common and better grades from which they cut the pieces of different sizes and quality for their needs. They use much thin lumber, such as for the box boards of toy wagons and wheelbarrows, and they are able to utilize the material very closely, even though considerable clear stock is required, because of the very large variety of products manufactured. Some firms use the waste from the manufacture of other articles, such as piano and organ keys. However, since toys must ordinarily be produced at low cost, the general run of small and odd-sized pieces of waste from other factories can not usually be employed at a profit, because of the added expense of labor in working it up. Toys are generally manufactured in large quantities by machinery, and the production would be seriously reduced by the use of much small material of various shapes. Some firms using basswood for other articles utilize their own waste by converting it into such toys as can be made to advantage from the sizes they have available, and this can often be done at a considerable profit.

Yellow poplar is also used in toy manufacture, but where it is to be left unpainted the color is considered not so attractive as that of basswood. White pine is also put to the same use but it is not so desirable, because it splits more readily. On account of its limited supply and the advancing prices on basswood and its most common substitutes, toy manufacturers are constantly seeking a suitable new substitute. Cottonwood is not satisfactory, it is stated, because it does not machine to a sufficiently smooth surface. By careful seasoning it is possible that tupelo and the sapwood of the red gum can be utilized, at least for those toys which are intended for indoor use. The principal States making products of this class from basswood are New York, Pennsylvania, Ohio, and Wisconsin.

AGRICULTURAL IMPLEMENTS.

Basswood enters into the construction of a large variety of agricultural implements. It is used mainly for inside work, chutes, drawers, partitions, and boxes of various kinds, and in general where a high degree of strength is not required. It is a favorite wood for use in grain separators, seeders, and fanning mills, for

parts of feed mills, and in containers or conveyors of shellers, graders, and planters. It also serves in a small way for parts of such farm implements as cultivators and hayrakes.

Wisconsin and New York use the largest quantities of basswood for these products. Where basswood is not so readily available, other woods are used for the same purposes. In fact, yellow poplar is used in much larger quantities in this industry, is fully as suitable, and has the advantage of being available in larger quantities and greater widths. Southern yellow pine and white pine are also much used for these purposes.

FIXTURES.

Basswood is an important wood in the manufacture of store, office, and bank fixtures and is also used for church and school furniture, such as pews, altars, and desks. It goes mainly into the interior and hidden parts, where it is used principally in the form of small pieces. It is valued for such parts because it is a good wood to work with tools and takes nails and screws well. It also serves for the cores of high-grade panels covered with veneer of figured wood. In this class of products, as in furniture, much of it is used for drawers, linings, and partitions, and it is well adapted for cases and racks for holding and displaying goods in stores as well as for medicine cabinets and cupboards in dwellings.

Minnesota, Wisconsin, Michigan, and Illinois use the largest quantities of basswood for fixtures, because of its availability in those States. Prices paid for basswood for fixtures average about the same as for furniture, showing that about the same grade of stock is used for the two purposes.

VEHICLES.

The chief use of basswood in vehicle construction is for the bodies and panels of carriages, wagons, and automobiles. Much less wood than formerly is now used for vehicle body panels, because the wooden panel of the automobile body is now practically superseded by steel. Basswood is often used for wagon-top slats, and it also frequently goes into the construction of sleigh bodies, for which it is well adapted. Baby-carriage bodies and wheelbarrow sides are other vehicle parts for which the wood is suitable. It is used also for storage batteries, on account of its ability to hold its shape.

Wisconsin and New York are the principal States in the consumption of basswood for these purposes.

MATCHES.

A satisfactory match wood must light easily and burn with a good flame, and the stub should not retain the live coal long after the blaze has expired. It should be straight-grained and easily worked,

and should also hold the dipping material well. The wood should be practically free from defects and preferably light in color. White pine is the principal match wood in the United States, from which the round match is made by cutting from clear blocks of wood. Basswood is second in importance and is used in much smaller quantities for the production of the square or veneer match.

For the manufacture of the veneer match raw material is received at the factory in log form. The logs are boiled and cut into veneer the thickness of the match on a rotary veneer lathe. The veneer is then cut into strips in width corresponding to the length of the match stick. The sticks are then split from the veneer, and after they are thoroughly dried the ignition end is paraffined to make them burn better and is headed with the ignition material.

Aspen is the wood which is used almost exclusively in Europe for manufacturing veneer matches, and basswood has similar properties. Basswood matches are not so attractive looking as those made from white pine, because the basswood does not split so straight, and the match sticks are often very imperfect (fig. 7). Otherwise basswood is a very satisfactory wood for matches. Match factories use only No. 1 or veneer logs 8 inches and over in diameter. They are generally purchased in lengths which are multiples of 22 inches if less than a foot in diameter. Larger logs are usually any length from 3½ to 14 feet. The cost of such logs at the factory ranges from about $50 to $55 a thousand board feet. The timber used for this purpose is obtained mostly from farmers' woodlots, since the larger and more desirable timber goes mainly into the manufacture of lumber and high-grade veneer. This small sized timber is frequently defective, with many small knots, and there is much waste in converting it into the clear veneer stock. The logs are utilized very closely and can be cut down to a core as small as 2½ inches.

Farm woodlots in Iowa, Minnesota, and Wisconsin furnish a large part of the basswood used for matches.

REFRIGERATORS AND KITCHEN CABINETS.

The class of products included under refrigerators and kitchen cabinets might be termed kitchen furniture, since it includes refrigerators, kitchen cabinets, kitchen tables, and, in fact, all kinds of furniture made for kitchen and pantry use, except kitchen chairs. Basswood is well liked for these articles, because it has a clean appearance in the unfinished state and is odorless. It can also be painted or varnished advantageously, if desired. It is much used for the lining, shelves, drawers, and compartments of kitchen cabinets and for the tops of kitchen tables. Such parts are usually kept clean by scrubbing with soap and water, and basswood keeps its

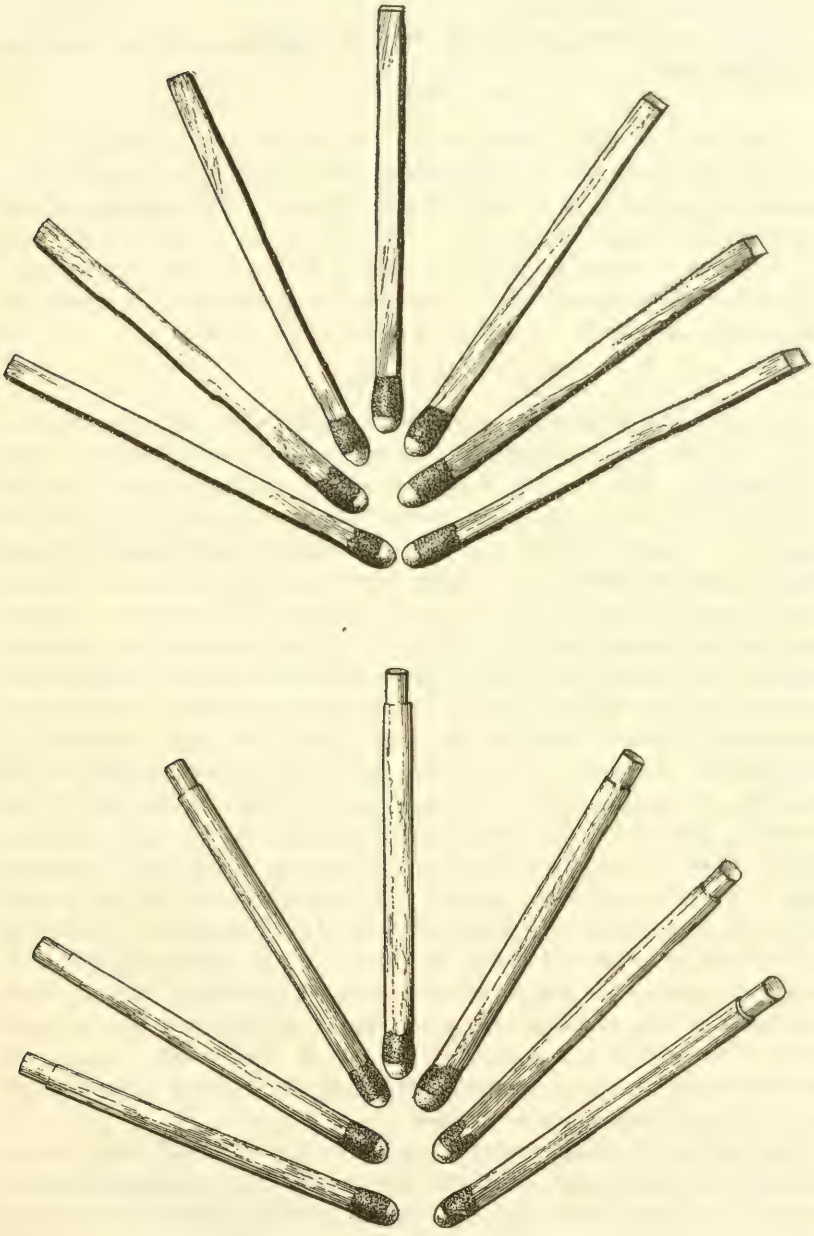


FIG. 7.—At top, basswood matches made by veneer process; at bottom, standard white pine matches.

shape when treated in this way. The No. 1 common grade or log run is generally used for the manufacture of such articles from which clear stock is cut for exterior parts, and lower-grade stock is utilized for the interior woodwork.

Indiana and Michigan use the largest quantities of basswood for these purposes.

CAR CONSTRUCTION.

Basswood is used in a small way in the construction of locomotives and freight cars in places where much strength is not required. For passenger cars, both steam and electric, it serves for exterior and interior finish, including panel work. It is valued highly for cores finished in expensive veneers, such as are seen in Pullman and private cars.

The use of basswood in this industry was reported, generally in rather small amounts, by a large number of States.

LAUNDRY APPLIANCES.

Basswood is the favorite wood for the manufacture of a large number of articles grouped under this head, because of its whiteness and light weight. For ironing boards it is the preferred wood, on account of its good appearance unfinished, and because it works so easily to a smooth surface and does not warp or split readily in use. Besides the regular-sized ironing boards, small skirt and sleeve boards are also made of this wood. Adjustable curtain stretchers used in laundering lace and other thin-fabric window curtains are preferably of basswood. The clothes rack which folds together like a screen and is used in drying clothes is commonly made of this wood. Basswood is much used for the front panel and top crosspiece of washboards, because of the white, clean appearance of the wood. Washboards are generally purchased on the basis of their good appearance, and one with a white, clean-looking panel will sell more readily than a less attractive one. Moreover, a printed advertisement is usually put on the panel by the manufacturer, and basswood shows such printing exceedingly well. Other laundry appliances are frequently stenciled with the name of the firm, and for this reason basswood is the favorite wood. Clothespins of the kind composed of two wooden strips held together by a wire spring and called "clip pins" are sometimes made of this wood. Basswood also serves for parts of washing machines where good strength and wearing qualities are not requisites.

Manufacturers using mainly the clear, white wood have much difficulty in disposing of their discolored and low-grade stock. Some firms covert this stock into small articles, such as round bottoms of fancy baskets; others sell such material to box factories. Manufacturers generally find it most advantageous to buy log-run lumber and work out of it the stock they need, rather than to pay

the price for very high-grade lumber. Some firms using large quantities of basswood for other purposes find it advantageous to utilize small clear pieces in the manufacture of small laundry articles, such as washboards. Basswood has been so high-priced and difficult to obtain in recent years that many manufacturers of laundry appliances have been compelled to substitute yellow poplar, although its color is not generally liked so well, and much of it is more difficult to work.

The largest quantities of basswood used for these products have been reported from Illinois, Michigan, New York, and Pennsylvania.

TOBACCO BOXES.

Because of the difficulty of obtaining Spanish cedar, which is the standard cigar-box wood, a large number of substitutes are employed. A satisfactory wood for cigar boxes should work well into thin lumber or veneer, hold its shape, nail without splitting, and have an attractive appearance. Basswood, stained to resemble Spanish cedar, is probably the best substitute. The imitation is made even more complete by passing the thin lumber between rollers which stamp it to give the appearance of the genuine cedar, and the cedar odor may be imparted by washing it with extract of cedar shavings and sawdust. Only the highest grade of lumber is used for this purpose. It is carefully piled on sticks and kiln-dried just before it is resawed into thin cigar-box lumber, which is usually about three-sixteenths of an inch in thickness. Basswood is also used as core, on which thin veneer of Spanish cedar is glued, and is well adapted for this purpose.

Some basswood goes into the construction of tobacco boxes of other kinds, because it does not impart stain or odor to substances in contact with it. It is also used for humidors, which prevent cigars from drying out. Yellow poplar is also used for these purposes. Tupelo and red gum are likewise employed for these uses; but they are less desirable, because of the darker color of the woods and their tendency to warp.

The greater part of the basswood reported for the manufacture of cigar boxes was used in Wisconsin factories.

BOOT AND SHOE FINDINGS.

The principal use of basswood in boot and shoe findings is for shoe forms or fillers. These are similar in shape to the last, which is of some hardwood, usually hard maple. Shoe forms are used to maintain the natural shape of the shoe in samples displayed in show cases and when being handled by traveling salesmen. They are made to fit the shoe perfectly and give an effect similar to that produced when the shoe is on the foot. Fillers should be light in

weight to save cost in transportation in salesmen's trunks. These forms are tooled to final shape from the rough-turned blocks; and to reduce weight to the minimum they are often hollowed. Basswood is considered the most practical wood for this use, because it is light in weight, easily worked, does not split readily, and holds its shape well. The wood is also used for lasts for rubber boots in some instances. The increasing high cost and scarcity of basswood have made a demand for a lower-priced substitute, but none seems available which is as suitable.

The wooden soles of clog shoes are often of basswood. Such shoes have leather tops and are for use in wet and cold places, such as tanneries, creameries, mines, dye works, fish canneries, slaughter houses, paper mills, and in foundries and metal works. They are also used where a durable, low-priced shoe is desired. Yellow poplar is often used in place of basswood for wooden soles. A high quality of wood is required for these products, and the percentage of waste is high, especially in the use of thick stock or billets for the manufacture of the shoe forms.

New York, Massachusetts, Maine, and Michigan reported the largest quantities of basswood used for these purposes.

CASKETS AND COFFINS.

Basswood is used in several ways in the construction of caskets and coffins. It is made into cheap caskets and coffins, which are often stained to imitate more expensive woods; and it is well adapted for use in this way, because it is easily worked and finishes well. It is also frequently used for the cloth-covered casket. Its main use in the industry, however, is as a core wood for panels of expensive caskets covered with veneer and for moldings and carved work on such caskets. The outer case, usually called "rough box," which also often serves as a shipping case for the casket, is sometimes made of basswood because of the good appearance of the wood.

A large number of States reported comparatively small quantities of basswood used for this purpose.

PROFESSIONAL AND SCIENTIFIC INSTRUMENTS.

Basswood is well liked for many professional and scientific instruments because of its good color, ease of working, and light weight. It is a favorite wood for yardsticks and rulers because it shows printing to advantage and does not warp. Manufacturers of advertising novelties use large quantities of basswood, particularly for yardsticks on which advertising matter is printed. Drawing boards and the tops of draughtsmen's tables have certain requirements which must be met if they are to be satisfactory. The wood must be soft so that the thumb tack used to fasten the sheet in place

can be driven in with the pressure of the thumb and can be easily withdrawn; at the same time the wood should hold the thumb tack in place. Such boards are often made of several plies to obviate any tendency of the wood to warp or split. Basswood is a preferred wood, and yellow poplar is also satisfactory; white pine, sugar pine, and redwood are much used for this purpose. Because of its suitability for printing, alphabet blocks of basswood are made in large quantities. It is also employed in the manufacture of cameras, the wooden box and other small wooden parts of such instruments consuming large quantities in the aggregate. Boxes for holding various professional and scientific instruments, including carpenters' tool chests and optical instrument cases, are often of basswood. Pasteboards for paper hangers are also made of this wood. It is used for cigarmakers' molds, because it is readily carved, and as labels for potted plants on which writing or printing must show well. Pencils and penholders of basswood are stained to give an attractive appearance. It also serves for spirit levels and the backs of thermometers.

More than two-thirds of the entire amount of basswood reported to the Forest Service by manufacturers for these uses was consumed in New York State.

HANDLES.

Basswood is not adapted for handles of such tools as axes, sledges, forks, and hoes, because it lacks the necessary strength. It is used in considerable quantities, however, for broom and mop handles, and for the long handles of window brushes. For short handles of trowels, soldering irons, and files it serves very satisfactorily, and also for the handles of engravers' tools. Harder woods, such as beech, birch, and maple, are generally more satisfactory than basswood for such handles, however, because they are stronger, wear better, and do not split so readily.

Ohio and Michigan reported the largest quantities of basswood for handle manufacture.

SHUTTLES, SPOOLS, AND BOBBINS.

Basswood is the sixth wood in importance in the shuttle, spool, and bobbin industry, birch and maple being most largely used. Basswood is made principally into the one-piece spool for holding thread or tape, and for the ends or disks of three-piece spools, which are much larger and are used in textile mills. Paper or white birch is most commonly used for these spools; but basswood is satisfactory, because it turns well and makes a spool that looks well.

The bulk of the basswood used in this industry was reported by Massachusetts and New Hampshire.

CHAIRS.

Although basswood ranks about tenth in amount among the woods used for chairs, it is not considered an important chair wood because such material should in general be able to stand loads and shocks. Its use is mainly for seats, seat frames, and backs of cheap chairs, where it serves in the form of plywood, and in high-priced work, such as cores for panels.

CLOCKS.

Basswood is second in importance among woods used for clocks, oak being consumed in larger quantities. Basswood is much used for hidden work and the backs of cases; it is a favorite wood for cases finished in enamel work, and is popular in the imitation of foreign woods, marble, and other materials. Basswood also serves as core wood for figured veneer work, which is much used in clock cases.

Connecticut reported the bulk of the basswood used for clock manufacture.

MACHINE CONSTRUCTION.

The amount of basswood used in the construction of machines is surprisingly large, considering that a high degree of strength is generally required for this purpose. Basswood finds its use in this industry mainly for boxes and spouts, such as are used in flour-mill machinery, and for woodwork of looms and parts for which a light, soft wood is desirable.

SHIP AND BOAT BUILDING.

Basswood finds a useful place in ship and boat building mainly as a finish material. It is well adapted for moldings and other woodwork for the interior of cabins, especially where finished in enamel. It is put to a large number of other uses.

BRUSHES.

Basswood stands fourth in importance among woods used in brush making. Beech, birch, and hard maple are each used in much larger quantities. These woods are more desirable for this use because of their greater hardness and resistance to splitting. Basswood generally goes into the cheaper, rough, unpolished handles, while the other woods mentioned are used in the manufacture of higher-grade articles.

SHADE AND MAP ROLLERS.

The chief use of basswood in the shade and map roller industry is for curtain poles. It serves well for this use, because it is so easily worked and because the ease and permanence with which it takes paint and stain allow it to be finished to imitate expensive hardwoods,

such as walnut, mahogany, and oak. Rug and drugget poles, which are lower-grade products, are also made of basswood. This wood is not adapted for heavy poles, for which maple, birch, oak, and ash are more serviceable. Some basswood is used for window-shade rollers, but white pine is the usual wood employed for this purpose. Awning poles are often of basswood, because a light-weight wood is desirable.

PULLEYS AND CONVEYORS.

Basswood is used for the rims of wooden pulleys, because it is light in weight, has good gluing qualities, holds nails well without splitting, and does not shrink, swell, or warp greatly. Wooden pulleys are preferable in many cases to those of metal, because the lighter weight renders them less likely to break through centrifugal force. These rims are generally built up of a large number of pieces, which are carefully fitted and glued together. Since basswood will not stand a large amount of wear, harder and therefore heavier woods are used in larger quantities.

Basswood is employed in the construction of buffer wheels, such as are used for polishing metal and glass; and it is preferred for this use, because it is fine-grained and holds the polishing materials well. These wheels are usually made up solid of about six pie-shaped pieces, which are dove-tailed and glued together, making a strong, light-weight disk.

PRINTING MATERIAL.

The use of basswood in the printing industry is mainly for parts of printers' type cabinets and as base blocks for rubber-stamp pads. It commonly serves as bottoms of type boxes or trays, often in the form of veneer; for the latter use a low-grade material is employed.

SPORTING AND ATHLETIC GOODS.

Basswood serves to advantage for the inside framework of billiard and pool tables, because it holds its shape well. It is also employed to a considerable extent for fishing-line blocks on which the line is wound, because of its light weight.

SEWING MACHINES.

For sewing-machine cabinets, basswood is used to advantage as a corewood for expensive veneers, and as sides and bottoms of drawers and compartments, where its white, cleanly appearance makes it a preferred wood.

ELECTRICAL MACHINERY AND APPARATUS.

In the making of electrical apparatus basswood is used especially for spools for holding small-gauge wire, for base blocks, and for parts of such electrical apparatus as telephone cabinets.

PLUMBERS' WOODWORK.

Basswood is adapted for toilet and medicine cases or cabinets, towel cabinets and racks, and other cabinet work for toilets, which may be finished in basswood and painted in imitation of more expensive woods, or enameled to match the tile work of the room. Such cabinets are more often finished in a more decorative wood, such as white oak or birch.

DOWELS.

For wooden pins used to hold wooden parts together, mainly in cabinet work, basswood is a preferred wood, because of its good turning qualities. Where the parts are subjected to much strain, stronger woods, such as birch, beech, and maple, are required; and these are the principal species used.

PATTERNS AND FLASKS.

Basswood is a very suitable wood for patterns, because it is so easily worked, keeps its shape, and does not split easily. It is used mainly in shop patterns, and it is well liked for templets in shipbuilding. High-grade, fairly clear stock is required for this use.

SIGNS AND SUPPLIES.

Since basswood shows painting and printing to such advantage, it is well adapted for small signboards. White pine, however, is the favorite wood for this purpose and is more durable in situations exposed to the weather. Basswood signs should be kept painted in order to give good service.

SADDLES AND HARNESS.

Basswood is valuable for saddletrees, because it is light in weight, strong for its weight, and is easily modeled into various forms. It is adapted for light-weight saddles; for those requiring a high degree of strength, such as the pack saddle and the cowboy saddle, heavier and tougher woods are required. Clear, high-grade, thick stock is utilized for this purpose. Basswood is also used for stirrups, in which it serves for the head or neck blocks.

MARKETS.

On account of its growing scarcity and the high value placed upon it for special uses, there is usually little difficulty in finding a ready market for basswood timber. It is commonly sold in the form of lumber, log, and bolt. Where the timber stands are far distant from the factory, basswood is generally manufactured into lumber along with other hardwood species with which it grows in mixture. Cooperage and woodenware plants, however, in some instances buy tracts of timber from which they log the basswood and other species. In

sections of the country where factories using basswood are located, logs, bolts, and lumber generally find a ready sale. As a rule, it is preferable for the small timber owner to market basswood timber in the log rather than to saw it into boards and planks, because the factories using logs can utilize the timber in this form to much greater advantage (Pl. VI).

Basswood logs are marketed to best advantage in the winter time, because the timber is less apt to become stained and decayed in cold weather through the action of molds and wood-destroying fungi. In warm weather logs should not be allowed to lie in contact with the ground for more than a few days, but should rest on skids, and should not remain in a damp situation for an extended length of time, because basswood deteriorates very rapidly under such circumstances. Farmers usually find it most convenient to cut their timber and haul it to the railroad during the winter months. In disposing of their timber, owners of small tracts will find it to their advantage to get in touch with their State forestry departments in order to obtain names of possible purchasers, prices, and specifications.

Since many firms quote prices at the mill or factory, the following weights of basswood in various forms are given, from which freight costs may be figured:

	Pounds.
Rough lumber, 1 inch thick, 1,000 board feet:	
Green	[3] 4,200
Dry	[3] 2,500
Logs, 1,000 board feet, log scale, Doyle Rule:	
Diameter inside butt at small end, 6 inches—	
Green	43,800
Dry	27,800
Diameter inside butt at small end, 12 inches—	
Green	9,400
Dry	6,000
Diameter inside butt at small end, 18 inches—	
Green	6,600
Dry	4,200
Diameter inside butt at small end, 24 inches—	
Green	5,600
Dry	3,500
Bolts, butts, etc., 1 cord of 128 [4] cubic feet:	
Green	3,700
Dry	2,300

LUMBER.

Basswood lumber, if well manufactured, is readily salable to a large number of industries. High-grade stock is in demand by manufacturers of musical instruments, apiarists' supplies, and cigar boxes. For piano keys, thick stock is required which should be white

[3] Official standard weights of the National Hardwood Lumber Association.

[4] Figured on the basis of 90 cubic feet of solid wood content.

in color. The white stock is also demanded for bee-keepers' supplies, for which the No. 1 common grade is often purchased. Firsts and seconds is the usual grade for the manufacture of cigar boxes. The combined grade of No. 2 common and better grades is probably most commonly used, especially by factories making toys, trunks, kitchen cabinets, and dairymen's and apiarists' supplies. For planing-mill products, sash, doors, blinds, and general millwork, a good grade of lumber is employed. For boxes and crates, lower grades are employed as a rule, usually Nos. 2 and 3 common. No. 1 common is also sometimes used.

Furniture and trunk factories use basswood very largely in the form of built-up stock, which is generally the product of the veneer mill.

LOGS.

The higher-grade logs are purchased by mills cutting veneer for various products. Factories making panels for trunks, furniture, and cabinets of various kinds require logs of good quality which must be reasonably clear, straight, and round, so that they will cut to advantage into rotary veneer (Pl. VI). These factories will take hollow logs if the log is otherwise of good quality. The hollow portion of such logs must, of course, not be too large and there must be a thick rim of sapwood around it (Pl. VIII). The minimum diameter of logs purchased by these veneer plants is usually 10 inches. For the No. 1 or veneer log grade about $35 to $40 is the usual price paid at the factory.

Some of the veneer plants, including those manufacturing lower-grade products, such as cheese boxes, also have a sawmill equipment and convert lower-grade logs into lumber, which they use in the manufacture of their products. They buy woods-run logs, which bring about $20 to $30 a thousand board feet f. o. b. cars. The price at the factory is generally $5 to $8 a thousand more. Basket factories generally pay somewhat less. In some instances they purchase sizes down to 6 inches in diameter at a comparatively low cost. Match factories using basswood require logs of high quality for veneering. They generally use No. 1, or veneer, grade, which must be free from black heart-rot and reasonably free from knots. Sizes down to 8 inches in diameter and 22 inches in length are taken. The specifications usually call for 8 to 12 inch diameter material in lengths which are multiples of 22 inches up to 15 feet. Logs over 12 inches in diameter are preferred in lengths between 3½ and 14 feet. No. 1 logs cost match factories about $50 to $55 a thousand board feet, freight included. No. 2 logs suitable for this purpose bring $5 to $10 a thousand less. Match factories must frequently get their logs from a considerable distance, and the resultant high freight costs often amount to from $10 to $15 a thousand board feet.

Large cooperage and woodenware factories get their timber very largely from their own tracts. Small firms must usually depend on purchase from various sources. Cooperage factories use logs 7 inches and over in diameter at the small end for barrel heading. Factories making pails and tubs use the largest quantities of basswood. They generally prefer woods-run logs, for which they pay about $30 a thousand board feet on board cars at loading point, taking sizes down to 6 inches in diameter at the small end (Pl. VII). Lengths of 8 to 10 feet are preferred, but shorter lengths of about 3 feet are often purchased. Some firms buy only No. 2 logs, which are small and largely defective, often with hollow centers, and pay about $15 a thousand board feet loaded on cars. Logs 6 inches and up in diameter are taken if not too defective, and even some 4-inch sizes are accepted if they are of good quality. Hollow logs with a 4-inch shell are taken by some factories if they are otherwise sound. Second-growth, clear, white basswood is preferred by these factories because it makes a much more attractive pail. Last-block manufacturers purchase basswood logs as small as 12 inches in diameter at the small end. Factories making ladders sometimes buy basswood in the log also.

Box factories in many instances buy basswood in the log. The logs are also frequently used for the manufacture of vegetable crates.

BOLTS.

Basswood in bolt form is used by excelsior and pulpwood plants. Excelsior wood should be of good quality, sound, reasonably straight, and free from knots. Lengths of 36, 37, 54, and 55 inches are the most common ones specified, and a minimum diameter of 4 inches is accepted. Diameters of 7 to 12 inches are required to be split in half, over 12 inches split into four pieces, and very large sizes split in proportion. Some firms require that the large bolts be split to the heart into pieces 6 to 8 inches wide on the bark side. Excelsior wood is usually purchased green and unpeeled or dry and peeled. Some factories accept peeled stock in the green or partially air-seasoned condition. Usual prices paid for 36 and 37 inch lengths are $3 to $4 a cord with bark, and $4 to $5 peeled; for 54 and 55 inch lengths the prices are proportionately greater. The cord for all lengths given is 4 feet high and 8 feet long. These prices are for wood on board cars at loading point. The price at the factory is usually 50 to 75 cents a cord more for 37-inch wood. Excelsior wood should not be allowed to dry with the bark on, because it can be barked satisfactorily only when the wood is green. Wood which has thoroughly air seasoned is most acceptable; ordinarily it should not stand more than two years, however, as it may become brittle and is likely to be attacked by decay, which impairs its value. If it is to stand in piles for any

length of time, it should rest on poles or sticks to keep it off the ground. A space of about 2 feet should be left between piles to allow it to dry properly. Kiln-dried wood, if subjected to too high temperatures, often exhibits a brittleness when cut into excelsior, which makes it less desirable than the air dried. It is often very profitable for the small timber owner to convert his basswood trees into excelsior wood rather than to market them in other forms, because the small-diameter material and limbs can be more closely utilized.

Basswood is also valuable as pulpwood, for which use it is purchased at the same price as poplar. It is used for pulp mainly in the southern Appalachians. Specifications call for 5-foot lengths, with a minimum diameter of 4 inches. Bolts 4 to 7 inches in diameter are not to be split, more than 7 and up to 10 inches in diameter to be split once, more than 10 and up to 14 inches quartered, and above 14 inches to be split in proportion. Basswood pulpwood usually brings about one dollar more per cord than beech, birch, and maple pulpwood.

Woodenware factories, particularly those making pails and tubs, frequently buy bolts with a minimum diameter of 4 inches to 6 inches. Lengths are usually 40 and 52 inches. In some cases longer lengths are accepted. The price paid on cars at loading point ranges from about $6.50 to $8 per cord and the freight amounts to $1 to $2 a cord more. Second-growth timber is preferred. Box factories in some instances buy basswood bolts for conversion into crating. They take diameters down to about 6 inches, and 52-inch lengths are usually preferred.

Where the timber runs small in size, and especially on cut-over tracts, where there is much young, rapid-growth stock, the bolt is the practicable form for marketing.

SUMMARY.

Basswood is an important commercial timber of the northeastern part of the United States. Since it grows in mixture with other hardwood species and does not form dense stands, it has never been a very plentiful timber. In regions where it was formerly comparatively abundant, particularly in New York, Pennsylvania, and Ohio, various industries have greatly reduced the supplies available, so that it is now scarce in these States. The Great Lakes and southern Appalachian regions are now the main sources of the timber. Wisconsin and Michigan have furnished the largest quantities for the last 20 years. During the last 12 years the quantities used have diminished greatly; the amount of basswood lumber manufactured during this period has been reduced by about 50 per cent. The period of maximum lumber production was from 1906 to 1910; in

each of the years 1906, 1907, and 1909 the total amount of basswood lumber cut was about 400,000,000 board feet. At present the total annual use of basswood for all purposes probably does not exceed 250,000,000 board feet. The total stand of basswood timber is estimated to be about 9,000,000,000 board feet.

Basswood is valued mainly for its light color, light weight, and good working and seasoning qualities, and because it shows printing to advantage. It is used mainly for wooden containers and utensils which come in contact with food, including boxes, barrels, pails, tubs, and kitchen woodenware. Cabinetwork and inside finish of buildings are also important uses.

Raw material is used in the form of the log, bolt, and lumber. Logs are used for the production of veneer, which is made into plywood for trunks, furniture, and other cabinetwork. Logs are also converted into veneer for cheese boxes. Basswood in the log is used for the manufacture of matches by the veneer process. Logs are also used in large quantities for making pails, tubs, and slack-barrel heading. The bolts are used mainly for conversion into excelsior and pulpwood. The principal uses in the form of lumber are for boxes, inside finish, apiarists' supplies, laundry appliances, and toys. Its most exacting use is for honey sections to hold comb honey, for which purpose a white wood is required. Basswood is an ideal wood for candy pails and cracker and candy boxes, because of its clean appearance and light weight and because it does not taint substances in contact with it. Its light color also makes it very much in demand for flour-barrel heading, cheese boxes, excelsior, pulpwood, and laundry appliances, including mainly washboards and ironing boards. Its lightness and good seasoning and gluing qualities make it an excellent core wood, producing a strong, light panel. Because of these properties it is the preferred wood for trunks.

Basswood generally finds a ready market in the form of the log or bolt, or as lumber. For the small timber owner the log and bolt are the most advantageous forms for marketing. Large, clear, high-grade logs bring the best prices when sold for conversion into veneer. Small and low-grade logs and bolts can be disposed of most profitably to woodenware and slack-cooperage factories. Clear, small-dimension stock can be sold to best advantage to excelsior and pulpwood plants. It is desirable to obtain information on prices, specifications, and methods of measurement from prospective purchasers before the standing timber is converted into marketable form.

Since basswood reproduces easily and increases in size rapidly in situations favorable for the growth of the tree, and since the timber is readily marketable in various forms, owners of land suitable mainly for timber production in the basswod region will find it advantageous to encourage the growth of this species.

APPENDIX.

Classified list of uses reported for basswood by factories.

AGRICULTURAL IMPLEMENTS.

Alfalfa grinder parts.
Corn grader frames.
Corn huskers.
Corn planters.
Corn shellers.
Fanning-mill drums.
Fanning mill sieve frames.
Fanning mills.
Feed grinders.
Feed mills.
Feeder slats.
Garden cultivators.
Grain cleaners.
Grain hoppers.
Grass seeders.
Grass-seeder boxes.
Hay loaders.
Hayracks.
Hayrake parts.
Hullers.
Peach graders.
Potato planters.
Seeder boxes.
Separators:
- Bean.
- Grain.
- Threshing machine.

Tanks, threshing-machine.
Thrasher boxes.
Threshing machines:
- Dust conveyors.
- Tanks.

Threshers:
- Braces.
- Grain pans and shakers.
- Grain registers.

Wheat fans.

BOOT AND SHOE FINDINGS.

Hollow lasts.
Lasts.
Shoe clog soles.
Shoe fillers.
Shoe forms.
Shoe frames.
Shoe lasts.
Shoe trees.

BOXES AND CRATES.

Baskets:
- Berry.
- Clothes.
- Fruit and vegetable.
- Grape.
- Split.

Basket covers.
Basket hoops.
Basket splints.
Boxes:
- Berry.
- Bottle.
- Bread.
- Butter.
- Candy.
- Chocolate.
- Confectionery.
- Druggist.
- Fancy.
- Folding.
- Fruit.
- Glove.
- Knife.
- Lock-corner.
- Mailing.
- Novelty.
- Packing.
- Polished.
- Poultry.
- Printed.
- Rubber type.
- Shirtwaist.
- Tool.
- Type.
- Utility.

Box shooks.
Cases:
- Egg.
- Packing.
- Shipping.
- Type.

Crates.
Crates, bushel.
Crating.
Lids, grape-basket.
Tea chests.
Trays, egg.

BOXES, TOBACCO.

Cigar boxes.
Humidors.
Tobacco boxes.

BROOMS.

Broom handles.

BRUSHES.

Brush:
  Backs.
  Blocks.
  Handles.
Brushes.

BUTCHERS' BLOCKS AND SKEWERS.

Skewers.

CAR CONSTRUCTION.

Car finish, outside.
Car:
  Repairing.
  Roofing.
Cars:
  Freight.
  Interior finish.
  Railroad.
Ceiling, car hood.
Dust guards:
  Freight cars.
  Railway cars.
Locomotives.
Locomotive woodwork.
Passenger cars:
  Interior finish.
  Interior work.
Railroad coaches.

CASKETS AND COFFINS.

Caskets.
Caskets:
  Cases.
  Corners.
  Molding.
  Panels.
Coffins.

CHAIRS.

Chair seats.
Chairs.
Seat frames.

CLOCKS.

Clock cases.

COOPERAGE.

Heading:
  Barrel.
  Slack cooperage.
Spice kegs.
Staves.
Staves:
  Slack cooperage.
  Tight cooperage.

DAIRYMEN'S, POULTERERS', AND APIARISTS' SUPPLIES.

Beehives.
Beehive sections.
Bee boxes.
Butter molds.
Honey boxes.
Churns:
  Covers.
  Standards.
Honey crates.
Honey sections.
Incubators.
Poultry coops.
Poultry coops, bottoms.
Poultry crates.

DOWELS.

Dowels, furniture.

EQUIPMENT, PLAYGROUND.

Exercise rings.
Swing seats.

EXCELSIOR.

Excelsior.
Excelsior:
  Mattress stuffing.
  Packing.

FIXTURES.

Alarm tills:
  Bottoms.
  Tops.
Altars, church.
Bank fixtures.
Cabinet drawers.
Cabinets.
Cabinets:
  Seed.
  Toilet.
Church furniture.
Church pews.
Cupboards.

Cupboards:
- Backs.
- Bottoms.
- Drawers.

Desks, school.
Die cases.
Display forms:
- Hosiery.
- Shoe.

Fixtures:
- Bank.
- Bar.
- Barber shop.
- Drug store.
- Office.
- Store.
- Store and office.

Frames, store fixture.
Interior frames, store fixture.
Medicine cabinets.
Medicine cases.
Pews, church.
Racks:
- Curtain display.
- Rug display.

Shoe cases.
Shoe racks.
Show cases, inside work.
Stands, Bible.
Stock racks.
Wall cases.
Water-closet, tank backs.

FRAMES AND MOLDING, PICTURE.

Frames:
- Mirror.
- Picture.

Molding, picture.

FURNITURE.

Backing:
- Enameled work.
- Mirror.
- Furniture.

Backs:
- Buffet.
- Bureau.
- Chiffonier.
- Chifforobe.
- Mirror.
- Wardrobe.
- Washstand.

Bedsteads, hidden work.
Bookcase backs.
Bookcases.
Bookcases, inside work.
Bottoms:
- Buffet.
- Case.
- Chiffonier.
- Dressers.

Card-table tops.
Carvings, wood.
Chamber suites.
Chest bottoms.
Chests, interior
Chiffoniers.
China closets.
China closets, interior.
Commodes.
Consoles.
Couches, box.
Couch bottoms.
Couch frames.
Drawer bottoms.
Drawer sides.
Dresser backs.
Dresser drawers.
Extension tables.
File cases.
Filing cabinets, tops and shelves.
Frames:
- Couch.
- Davenport.
- Lounge.
- Spring-bed.

Furniture:
- Case goods.
- Dining room.
- Hidden work.

Interior work:
- Furniture.
- Office desks.

Lawn furniture.
Letter files.
Lodge furniture.
Looking-glass backs.
Music cabinets.
Music cabinets, interior.
Novelty furniture.
Parlor furniture, frames.
Rails:
- Door.
- Table.

Record cabinets.
Serving tables, hidden work.
Shelves, desk.
Showcase tables.
Sideboards, interior work.

Slats, bed.
Stands, typewriter.
Store and office furniture, interior work.
Tables.
Tables:
  Extension.
  Inside parts.
  Inside work.
Table parts.
Table tops.
Tabourettes.

HANDLES.

Handles:
  Broom.
  Brush.
  Dipper.
  Engravers' tool.
  File.
  Long-handled dust broom.
  Mop.
  Pipe.
  Plastering trowel.
  Street brush.
  Trowel.
  Wall brush.
  Window brush.

INSTRUMENTS, PROFESSIONAL AND SCIENTIFIC.

Cameras.
Chalk triangles, schoolroom.
Drawing boards.
Engraving boards.
Glass-cutters' boards.
Medical batteries.
Pencils.
Pen holders.
Quills.
Rulers.
Saw frames.
Scales.
Spirit levels.
Thermometers.
Trays, enameling.

INSTRUMENTS, MUSICAL.

Bellows:
  Organ.
  Piano-player.
Bellows, organ, frames.
Blowers:
  Organ.
  Piano-player.
Bottom panels, piano-case.
Case parts, piano.
Cases:
  Band-instrument.
  Cornet.
  Drum.
Cheeks, piano-case.
Drums.
Fall boards, piano-case.
Guitars.
Key blocks.
Key bottoms, piano-case.
Key slips, piano-case.
Keys, piano.
Keys, piano (key racks).
Mandolins.
Mandolin necks.
Molding, piano-case.
Music shelf, piano-case.
Organs.
Organ backs.
Organ cases, folding organs.
Organ frames.
Organ keys.
Pedal cases.
Pianos.
Piano backs.
Piano cases.
Piano cases, sides.
Piano fronts.
Piano players.
Piano skeletons.
Pilasters, piano-case.
Pipe organs, interior parts.
Pipe organs.
Pipes, organ.
Rails, piano.
Tops, piano.
Top panels, piano-case.
Veneer cases, piano.
Violin cases.

LAUNDRY APPLIANCES.

Clothes bars.
Clothes driers.
Clothes pins.
Clothes racks.
Curtain stretchers.
Ironing boards.
Ironing boards, folding.
Ironing-board tops.
Laundry machinery.
Laundry machines, hydraulic.
Stretchers, curtain.
Stretching horses.
Tables, ironing.
Tubs, washing-machine.

MACHINE CONSTRUCTION.

Clay-working machinery.
Coal boxes, traction-engine
Coffee mills.
Cotton gins.
Engine jackets.
Flour-mill machinery.
Jack screws.
Loom ribs.
Loom shafts.
Looms.
Machinery bodies.
Machinery construction.
Mud shields, traction-engine
Presses:
  Cider.
  Wine.
Reed ribs, loom.
Road machinery.
Smut mills.
Spouting, flour-mill.

MACHINERY AND APPARATUS, ELECTRICAL.

Apparatus, electrical.
Fans, electric.
Spools, wire.
Telephone accessories.

MATCHES AND TOOTHPICKS.

Match sticks.

PATTERNS AND FLASKS.

Patterns.
Shop patterns.
Templets:
  Boat.
  Shipbuilding.

PLANING-MILL PRODUCTS.

Astragals, sliding-door.
Balusters.
Baseblocks, house interior trim.
Baseboards.
Baseboards, house interior trim.
Base corners, house interior trim.
Base molding, house interior trim.
Beams, dining-room ceiling.
Binding strips, school blackboard.
Book shelving.
Carpet strip. house interior trim
Casing.
Casing:
  Door.
  House.
  Window.
Ceiling.
Chair rail, house interior trim.
Finish.
Finish:
  Exterior.
  Interior.
Flooring.
Interior finish:
  Buildings.
  Churches.
Interior woodwork.
Molding:
  Bed, house construction.
  Cap, house interior trim.
  Cove.
  Crown, house interior trim.
  Drip cap, house construction.
  Electric wire.
  Plaster, house construction.
  Spring cove, house construction.
Nosing, house interior trim.
Parting strip, house interior trim.
Partitions.
Partition molds, house interior trim.
Plate rail, dining room.
Sheathing.
Shiplap.
Siding.
Siding, house.
Weather boarding.

PLUMBERS' WOODWORK.

Cabinets, toilet.

PRINTING MATERIALS.

Engraving boards.
Printers' cabinets.
Printers' supplies.
Rubber-stamp pads, base blocks.

PULLEYS AND CONVEYORS.

Pulleys.
Rims, split-wood pulleys.
Split pulleys.

REFRIGERATORS AND KITCHEN CABINETS

Backs, kitchen cabinets.
Bread boards, kitchen cabinets.
Drawer bottoms, kitchen cabinets.
Kitchen cabinets.
Kitchen cabinets, interior work.
Kitchen tables.
Refrigerators.
Shelving, kitchen cabinet.
Table tops, kitchen cabinets.
Tops, kitchen table.

SADDLES AND HARNESS.

Saddletrees.
Stirrups:
  Head blocks.
  Neck blocks.

SASH, DOORS, BLINDS, AND GENERAL MILLWORK.

Blinds.
Blinds, window.
Bottom rails, sash.
Brackets, plate-rail.
Butchers' coolers.
Capping, sink (house interior trim).
Case work.
Colonnades, house, interior trim.
Corner blocks, house interior trim.
Cornices, door.
Doors:
  Folding.
  Sliding.
Dust cap, house interior trim.
Frames:
  Front door, side light.
  Window.
Front doors, house.
Grilles.
Grilles, house, interior trim.
Head blocks, house interior trim.
Head casing, house interior trim.
Jambs, door.
Mantels.
Mantels, painted work.
Meeting rail, sash.
Millwork.
Mirror doors, house.
Mullions, sash.
Panel strips, house interior trim.
Panels, door.
Porch columns.
Porch work.
Rails, door.
Sash.
Sash, window.
Screens.
Screens, window.
Sink aprons, house interior trim.
Stair work.
Stiles, door.
Stops, door (house interior trim).
Stops, window (house interior trim).
Top rails, sash.

SEWING MACHINES.

Sewing-machine cabinets.

SHADE AND MAP ROLLERS.

Curtain poles.
Rug poles.
Window-shade rollers.

SHIP AND BOAT BUILDING.

Boats.
Shipbuilding.

SHUTTLES, SPOOLS, AND BOBBINS.

Bobbins.
Spools.
Spool heads.

SIGNS AND SUPPLIES.

Signboards.
Signs, advertising.

SPORTING AND ATHLETIC GOODS.

Automatic bowling alley bottoms.
Billiard-table beds.
Fishline blocks.
Indian clubs.

TANKS AND SILOS.

Silos.
Tanks, water.

TOYS.

Animals, toy.
Automobiles.
Blackboards.
Boats, toy.
Cannon and fort sets.
Circus sets.
Dolls.
Doll houses.
Doll parts.
Game boards.
Games.
Hand-sled tops.
Hobbyhorses.
Hobbyhorses, stick.
Horse rockers, children's.
Parlor games.
Pianos, children's.
Seats, tricycle.
Shooting galleries.
Sled tops.
Sleds.
Stocks, popgun.
Wagon, toy (sides).
Wheelbarrows.

TRUNKS AND VALISES.

Boxes, trunk.
Frames, suitcase.
Sample cases.

VEHICLES AND VEHICLE PARTS.

Automobile bodies.
Automobile panels.
Automobile roof and top slats.
Baby carriages.
Baby-carriage bodies.
Baby tenders.
Battery boxes, automobile
Bent vehicle parts.
Brake blocks.
Buggy bottoms.
Buggy repairs.
Business-wagon bodies.
Carriage bodies.
Carriage panels.
Carts, dump.
Delivery-wagon panels.
Desks, mail-wagon.
Doubletrees.
Frames, buggy-cushion.
Go-carts.
Panels, light vehicle bodies.
Panels, vehicle seats.
Panels, light vehicle seats.
Sideboards, wheelbarrow.
Sides, wagon-body.
Sides, wheelbarrow.
Singletrees.
Slats, wagon-top.
Sleigh bodies.
Sleighs.
Street-sprinkler parts.
Surrey-canopy frames.
Vehicle body panels.
Wagons.
Wagon dashes.

WHIPS, CANES, UMBRELLA STICKS.

Sticks, umbrella.

WOODENWARE AND NOVELTIES.

Boards:
- Bread.
- Carving.
- Cloth.
- Hosiery.
- Meat.
- Pastry.
- Potato chip.
- Potato peeler.
- Skirt.
- Slaw.
- Sleeve.

Book blocks.
Bowls.
Boxes, cheese.
Bucket bottoms.
Bucket covers.
Buckets, candy.
Buckets, sugar.
Butter ladles.
Candlesticks.
Carved woodenware.
Checkers.
Checks:
- Barbers'.
- Haybalers'.

Coat hangers.
Dominoes.
Envelope holders.
Fish kits.
Flag poles.
Flag sticks, railway.
Fruit driers.
Globes, geographers'.
Handles, fan.
Heading, cheese-box.
Jewelry-case frames.
Kitchenware.
Ladders.
Ladders, extension.
Ladders, step.
Lapboards.
Lard tubs.
Matchsafes.
Match strikers.
Novelties.
Novelties, burnt-wood.
Pails:
- Candy.
- Fish.
- Lard.

Panorama, religious.
Paper racks.
Porch shades.
Pyrography.
Reels, electric-wire.
Reels, solder-wire.
Seed cabinets.
Shredders.
Silverware cases.
Snow shovels.
Soap cups.
Souvenirs.
Step-ladder steps.
Strips, felt-bound (school slates).
Towel-roller frame.
Towel rolls.
Tub bottoms.

Gaylord Bros.
Makers
Syracuse, N. Y.

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